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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Current Issue.

The rapidly growing importance of the Queensland pig-raising industry is well recognised by the Government, and in order to give it a greater impetus the Department of Agriculture and Stock, through the Minister (Hon. W. N. Gillies), has secured the services of Mr. E. J. Shelton, an old Hawkesbury student and lecturer, whose work as a practical pig expert is already widely known in this State, as a travelling instructor. Under the caption "Classification in Pigs," Mr. Shelton contributes to this issue the first of a series of valuable articles on pigs and pig-raising. Mr. Eklund's interesting notes on "Irrigation in Queensland" are continued; they are attracting much attention from those concerned in our water problems. In observations on climatic cycles, Dr. Jensen discusses interestingly his theory of sunspot minima and their relation to drought and flood. Increasing interest in Red Polls has suggested some notes on the breed which will be useful to cattlemen. Entomological notes and other regular features cover a wide range of interest to readers, and as usual the Journal is well illustrated.

An Agricultural Session.

The parliamentary term just closed may well be described as an agricultural session. Not less than twelve measures, all relating to rural needs and problems, were initiated and piloted through Parliament by the Minister for Agriculture and Stock (Hon. W. N. Gillies). Some of the bills were of first importance to the industry, notably the Co-operative Associations Bill, Agricultural Bank Bill, Fruit Marketing Bill, and Cotton Industries Bill. The Minister for Lands (Hon. W. McCormack) also placed among the Queensland Statutes several important measures bearing on practical schemes of land settlement.

Co-operation at Work.

A comparatively little known 100 per cent. co-operative undertaking, instituted by the Queensland Department of Agriculture and Stock for the disposal of farmers' wool from small flocks, provides an excellent illustration of co-operation at work. The scheme enables the small sheep farmer to sell his wool without the intervention of any intermediary. The only charges are 10s. per bale for classing, freight, dumping, retailing, and any other out-of-pocket expenses. The numerical flock limit of farmers availing themselves of the marketing facilities under the scheme is 1,500 sheep. Sixty per cent. of the estimated value of the clip is payable to the farmer immediately on receipt of his consignment in the departmental woolroom. Each bale is classed and marketed so that it may not be offered under the "star lot" conditions usually applied to small consignments. The scheme has been in operation for several

years, and has proved an unqualified success, and therefore satisfactory to all concerned. With the farmers whom it was designed to benefit it is very popular. It is simply a plan by which the farmer sells his wool through the Department, obtains the highest possible price, and avoids the customary brokerage charges. The way it works is this: The wool on receipt is classed by departmental experts. It is then listed for sale as soon as possible, and returns, less the small handling charges mentioned, are paid promptly. The Department makes neither profit nor loss on the transaction. Costs are closely watched, and since 1916, the year of its inception, income and expenditure have balanced. Last year £13,000 worth of wool was sold. This was the produce of about 250 small flocks in many parts of the State, including the Gulf country. The scheme is truly co-operative, and only two consignors have withdrawn their wool from treatment under it since its initiation. It is clear that the man who only shears 1,500 sheep cannot afford to pay fees for skilled classing. Under ordinary arrangements his clip goes into the market under the severe handicap of being unclassed. This was one of the reasons that induced the department to institute this measure of protection for the small flock man. Delay in getting the wool to the sales is sometimes unavoidable, owing chiefly to the lack of uniform types to make up an attractive and saleable parcel. In order that the consignors may not suffer through delay, an advance against the consignment is at once paid and the balance is subsequently equitably adjusted. As the Department works on a margin of 40 per cent. of profitable market value, it is able to make the first valuation on a fairly liberal scale, and the first advance to the farmer a correspondingly high one. The whole scheme is thoroughly effective and is appreciated by the small flock owner who, under it, is assured of a fair deal and a prompt realisation of his clip.

Agricultural Education.

In agricultural education and organisation, the most important consideration is the evolving of a system under which the number engaged in productive agriculture is increased and sound practice becomes more and more a feature of primary industry. Some time ago the Senate of the Queensland University appointed a special committee to report upon a proposal to establish a Diploma in Agriculture. This committee has now presented to the Senate a comprehensive report on agricultural education, containing practical suggestions for its extension in this State. The committee is of the opinion that transition from the school to intelligent service, and later to independent responsible work, should be natural and automatic. This general statement is epitomised in two urgent requirements—(*a*) An organised and controlled system of agricultural studentship; (*b*) provision in the State land laws and departmental policy whereby trained agricultural students may become the preferred lessees or owners of State agricultural lands. Existing rural schools and high schools would be allied with the general scheme. The suggested diploma course, the examinations for which would be conducted by the University, would cover sound technical and scientific training. The proposals embodied in the report are practical and workable, and their application should be well within reach. The close interest taken in rural affairs by the highest educational authority in the State is sure to have a big beneficial influence on Queensland's agricultural future.

The Country's Contribution to the Common Wealth.

Australia is the greatest wool-producing country in the world; it produces cattle and meat of the highest quality; its wheat, being a hard, high-grade type, is much sought after by the world's millers; in maize production per acre it has established a world's record; its dairy products are second in quality to none within the universe; and it can produce temperate and tropical fruits of quality which no other land can excel. All this is due to the energy, enterprise, and resource of the primary producer, and here are the figures showing the country's contribution to the common wealth for one year:—

Fruit	£6,471,382
Vine products	2,792,771
Farm yard and dairy produce	44,416,854
Hay	18,172,462
Wheat	35,154,664
Agricultural products	81,889,700
Pastoral products	69,269,952
Barley	1,139,730
Maize	1,977,986
Oats	2,007,992
Potatoes	2,104,771
Bacon and hams	3,581,716
Butter	18,812,768
Cheese	1,435,777

A table of national production like that serves to emphasise the rural producer's importance in the community—an importance often underestimated by urban interests—it serves as a reminder that, to the rural producer is due Australia's present eminence among the world's producing nations.

IRRIGATION IN QUEENSLAND—V.

H. E. A. EKLUND, late Hydraulic Engineer, Queensland Water Supply Department.

The first of this series, an historical note, commenced in the July Journal. Irrigation on the Lower Burdekin was reviewed in the August number, and the instalment in the following issue covered irrigation in the West. In the October Journal practical considerations were discussed. The review will be continued through succeeding issues.—Ed.

SURFACE SUPPLIES.

I.—Available Supplies.

A farmer having convenient access to a good and reliable surface water supply, suitable and ample for irrigation, is particularly fortunate. He is almost criminally negligent if he fails to take full advantage of it. The question of plant and machinery in such a case is purely a question of getting ample power to supply the quantity needed, the more difficult and serious question of finding water being already solved.

The thrifty farmer does not delay the planting of a crop until his barn is empty. Nor should he delay the consideration of irrigation until a drought sets in. Preparing land for irrigation, obtaining suitable plant, and learning how to use it, takes time. A drought may commence any day and may do great damage, but the benefit of water judiciously applied when wanted will not be spoiled by a possible rainfall just after an irrigation. The safest plan to follow is to be prepared, and ready to cope with any emergency.

The system of irrigation to be adopted depends, primarily, on the general configuration of the ground. If this is very uneven it may pay better to use a spray system than to attempt grading or terracing. At the other extreme, if the ground is quite level the spray system may again be better than flooding; the crop to be grown in this case being the governing factor.

From the table showing the number of gallons required to give any desired number of acre inches, an idea of the horse-power required may be obtained. The power required is found by multiplying the weight of the water to be lifted per minute by feet lifted and the product so obtained divided by 33,000 gives the theoretical horse-power. Say, for example, that it is desired to raise sufficient water to apply one and a half inches per acre per hour. This corresponds to four and nine-sixteenths inches over a weir 2 feet wide, and is equal to 562 gallons per minute. If the lift from the surface of the water supply to point of delivery is 40 feet, we have:—

$$\text{Horse-power} = \frac{\text{G.P.M.} \times \text{weight of one gallon of water} \times \text{height of lift}}{33000} = \frac{562 \times 10 \times 40}{33000} = 7{\cdot}1 \text{ H.P.}$$

This is the theoretical power wanted, but in order to allow for friction in piping and efficiency* of pump the theoretical power must be increased. The amount of increase necessary will depend on local conditions such as the distance from centre of pump to water level, or "suction head," height from pump to discharge, or "discharge head," and the length of piping from pump to discharge. In all cases it is advisable to keep the pump as close to the water source as practicable in order to reduce the suction head.

* The term "efficiency" is the ratio of power applied to work done and is expressed thus: $\frac{\text{output}}{\text{input}}$ = efficiency. If the actual break horse-power developed by an engine driving a pump is found to be 10, and the weight of water pumped × by the height lifted ÷ 3300 = 7 H.P. This latter H.P. is termed water horse-power, and the efficiency of the pump is given by $\frac{\text{water horse-power}}{\text{break horse-power}}$ after making corrections for friction. In this case the efficiency of the pump would be seven-tenths or 70 per cent.

As the figure expressing the efficiency of any machine is always less than 1, it is perhaps difficult to understand why it is not called *deficiency*; which term would, to some extent, be self-explanatory.

The distance that a pump can lift water by suction is strictly limited. It depends on the atmospheric pressure at any place, and under best conditions attainable in actual practice is not likely to exceed 25 feet at sea level. The higher the altitude the lower will be the column that can be lifted by suction (see Table).

Friction of water in pipes varies:—(1) Directly as the length of the pipe; (2) increases with the roughness of the interior surface of pipe; (3) decreases as the diameter of the pipe increases; (4) increases nearly as the square of the velocity; (5) is dependent on the pressure of water.

Table VI. gives the frictional resistance, converted to feet head, in new and fairly smooth pipes, and the velocity at which water in the pipe must move to give the rated discharge. It is clearly not good economy to have the pipe too small, as the work required to overcome friction is a constant and unnecessary absorber of energy. It is equally unwise to go to the other extreme and a happy medium should be aimed at. Where pumping has to be continuous the velocity in the pipe should not exceed 3 feet per second, but a velocity of 5 feet per second, or even more, is not seriously objectionable if the pipe line is short and pumping intermittent, such as would be the case in irrigation.

Bends should be avoided as they tend to increase friction. The result of recent research in this direction, published in "Engineering News," Vol. 68, No. 14, p. 382, may be summarised as follows:—

1. The excess loss* of head in bends is greater for large pipes than for small pipes.

2. For large pipes a 6 feet radius bend gives the least resistance unless very long radii are used. If very long radii can be used the least resistance will evidently be from the longest radius.

3. For small pipes, at least, with long radii, the loss of head will be less than it would be in a straight pipe of a length equal to the tangents of the curve. This occurs when the saving in friction head, due to shorter line, becomes greater than the excess loss due to the bend.

Vertical bends are particularly obnoxious unless special precautions are taken. Collections of air at the top of a vertical bend will cause the pipe at that place to burst very frequently unless the line is straightened, or an air valve put in.

Assuming that the total length of the pipe line in the case under consideration is to be 1,500 feet, the table is examined to ascertain the most suitable size. A 7-inch pipe gives 580 gallons per minute at a velocity of 5.8 feet per second; the friction head being 1.93 per 100 feet. An 8-inch pipe 574 gallons, at a velocity of 4.4 feet, and a friction head of 1.02 feet; and a 9-inch pipe 562 gallons at 3.4 feet per second, with a friction head of only .567 feet per 100 feet of length. Total friction head in each case respectively is, therefore, $1.93 \times 15 = 28.95$; $1.02 \times 15 = 15.3$; and $.567 \times 15 = 8.5$. The power required to overcome this friction head is approximately 5.2 horse-power, 2.6 horse-power, and 1.4 horse-power respectively. The lesser first cost of 8-inch piping as compared with 9-inch will probably justify the adoption of 8-inch pipe, while the use of 7-inch pipe would considerably increase the first cost of the engine as well as cause a largely increased cost of maintenance.

The next step is to ascertain the efficiency of the pump to be used. Assuming a guaranteed efficiency of 65 per cent. for the pump, the necessary horse-power is obtained thus:—

$$\text{Horse-power} = \frac{\text{Volume wanted} \times \text{head} + \text{friction head} \times \text{weight of 1 gall.}}{33000} \times \frac{\text{efficiency of pump}}{65}$$

$$\frac{662 \times 40 + 15{\cdot}3 \times 10}{33000} \times \frac{100}{65}$$

$$= 14{\cdot}5 \text{ H.P.}$$

Where it is proposed to use a spray system of irrigation the pressure recommended by the makers for a satisfactory working of the spray must be converted from pounds per square inch to feet head and so added to the lift in feet. In spray systems of irrigation very careful designing is essential or the result is certain to be unsatisfactory.

If the water has also to be conveyed by open drain after pumping, an additional quantity, depending on the length of the ditch and quality of the soil, has to be pumped, to allow for seepage. This may be accomplished by pumping for a longer period, but it is not to be recommended, as small quantities or "heads" are not conducive to economy of time and labour in applying water to the crop.

* Friction in a bend is greater than the friction in a similar length of straight pipe. The difference constitutes "excess loss."

The area that one man can irrigate with a given quantity of water is approximately indicated below:—

Volume supplied from Pump or Ditch in Gallons per Minute	AREA COVERED IN ONE DAY AT A DEPTH OF—			
	3 Acre Inches.	4 Acre Inches.	5 Acre Inches.	6 Acre Inches.
200	1 — 1½	¾ — 1	1 — ..	¾ — ..
400	1½ — 2½	1 — 2	1¼ — 1¾	1 — 1½
600	3 — 4	2 — 3½	1¾ — 2½	1¼ — 2
800	4 — 6	3½ — 5	2½ — 3½	2 — 3
1,000	5 — 7	5 — 6	3½ — 4½	3 — 4

CHOICE OF PUMP.

The essentials of a pump suitable for irrigation are cheapness, reliability and efficiency. The centrifugal pump combines these features perhaps rather more than any other type, and is in addition very simple. It is durable and requires but little attention, while its efficiency, *when designed for the lift at which it is to operate*, is good. It is, however, a very easy matter to get a centrifugal pump particularly wasteful of energy, and every purchaser should, therefore, insist on a guaranteed efficiency to be fulfilled by test after installation, under supervision by some competent authority.

There are two types of centrifugal pumps—the turbine and the volute. The volute pump takes its name from the shape of the casing and it is usually a single stage pump, but volute pumps may be arranged to operate in series. The turbine pump originally differed from the design of the volute in having guide vanes on the casing somewhat similar to the water turbine. The designation is now applied to any pump having a concentric casing. Good efficiencies are obtained in both types, but the turbine type lends itself more readily to compactness and is, therefore, usually favoured where a multistage pump is necessary.

Either type consists of a shell within which revolves the impeller mounted on a shaft and carried by bearings. The water to be pumped enters at the centre from which it is forced by the action of the impeller. The energy thus imparted to the water creates pressure as a result of the velocity at which the water leaves the vanes of the impeller. The theoretical head against which a pump can deliver, therefore, depends on the velocity at which the impeller revolves; this limit being fixed by the design of the impeller.

In Figure 26 the component parts of a centrifugal pump are shown.

The quantity that any given pump can deliver against a certain head is termed its capacity. This is usually stated in gallons per minute. Makers of centrifugal pumps are usually willing to furnish diagrams showing the characteristics of the pumps which they recommend. In every case when a pump is purchased such a diagram should be insisted upon, if not voluntarily offered, so that the purchaser can, after installation and at any future date, check the performance of the pump.

Sometimes pumps may not be all that they are represented to be, but more often they are operating under conditions for which they were never intended. Many people are quite satisfied that the installing of a centrifugal pump is such a simple process that no advice is necessary. It is not until such an installation proves troublesome that an engineer is asked to investigate. The best conditions of operation of any centrifugal pump can only be determined by experiment unless the makers' diagram is available; in which case an error in the installation relating to head, or speed, or both, becomes fairly obvious. If these particulars are not available the determination of correct conditions for operation may be a tedious process and proportionately expensive.

As a useful approximation for obtaining the peripheral speed of the impeller in feet per second, take the square root of the total head, including friction, and

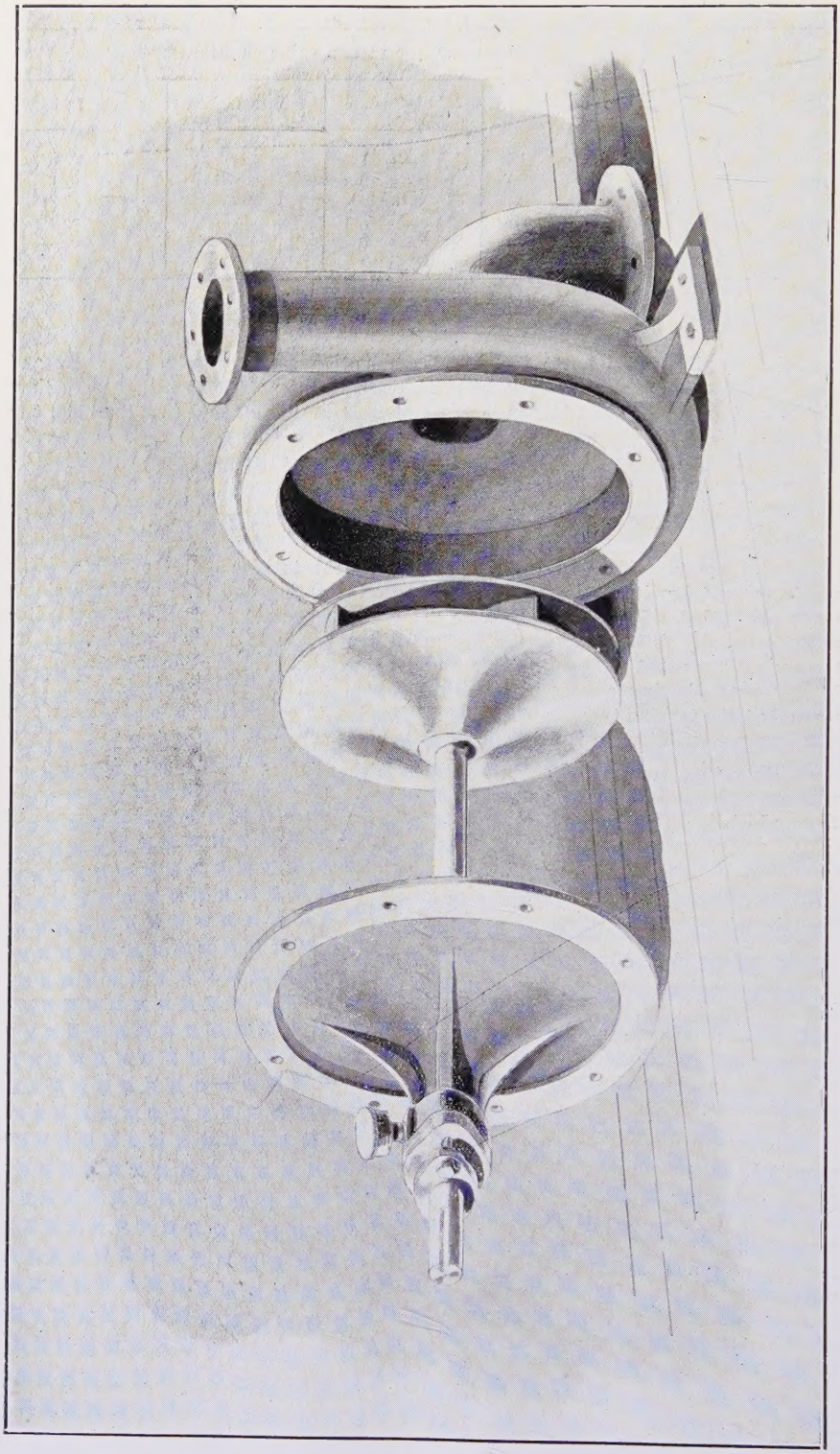


Fig. 26.—Centrifugal Pump Dismantled.

multiply this by 8. So that if total head plus friction is 64 feet the perpipheral speed of the impeller should be 64 feet per second. If the impeller is 8 inches in diameter the circumference is $8 \times 3.1415 = 25.1$ inches $= 2.1$ feet nearly. Hence the speed should be about 30 revolutions per second, or 1,800 revolutions per minute.*

Altering the speed of a centrifugal pump almost invariably means a change of pulleys. To get the correct speed take the rated speed of the pump multiplied by the size of the pulley supplied with it. This product divided by the speed of the engine will give the diameter of the driving pulley. If it is desirable to use the fly wheel of an engine as driving pulley, multiply the diameter of the fly wheel by its speed and divide by the speed of the pump. The result is the diameter of the pulley for the pump. It must, of course, be noted that all dimensions should be in the same unit, say inches, and the speed in revolutions per minute. In all cases where similar speed calculations are made it is easy to remember that driving speed $\times$ driving pulley = driven speed $\times$ driven pulley, and from this any one of the four can be found, the other three being known, thus:

1. $\dfrac{\text{Driving speed} \times \text{driving pulley}}{\text{driven speed.}} = \text{driven pulley.}$
2. $\dfrac{\text{Driving speed} \times \text{driving pulley}}{\text{driven pulley.}} = \text{driven speed.}$
3. $\dfrac{\text{Driven speed} \times \text{driven pulley}}{\text{driving speed.}} = \text{driving pulley.}$
4. $\dfrac{\text{Driven speed} \times \text{driven pulley}}{\text{driving pulley.}} = \text{driving speed.}$

Special centrifugal pumps designed for high efficiency under certain fixed conditions are, as a rule, not suitable for pumping from an open river where the water level may vary very considerably. In order to ensure satisfaction a prospective purchaser should approach makers of centrifugal pumps, fully stating the particulars necessary for their information as tabulated in Appendix I. Whilst urgent requirements may be supplied from agent's stock, it will be found more satisfactory to get pumps which are specially designed for the conditions under which they are to operate. There are quite a number of makers within the Commonwealth, and competition will ensure that the prices are as good as those of the imported article. The quality of some Australian-made pumps leaves nothing to be desired, and the writer is acquainted with cases where Australian-made pumps showed a better efficiency and capacity than similar imported pumps.

The pump diagram given in Figure 27 is of a standard American pump. An examination of this will show that the efficiency of the pump lies between 70 and 80 per cent. for a very wide range of capacity, and a large fluctuation in head. This pump has been designed to give a good efficiency at constant speed against a variable head. Such a pump is well suited for irrigation work, and this diagram may be compared with diagrams in Figures 29 and 30 which show the characteristics of some Australian-made pumps.

The principal features of the curves are very similar, and it is quite clear that Australian makers can at least hold their own in this respect.

It will be noted in all the curves that as the head decreases the capacity increases, and *vice versâ*; speed remaining constant. If the actual head is greater than that for which the pump was designed less water will be discharged; if the head

---

* The rule here given is founded on the equation—

$$V_2 = \theta\sqrt{2gh}$$

where $V_2 = 2\pi r_2 \dfrac{N}{60}$.

Various authorities give the value of θ as follows :—

Blaine 1 to 1·3.
Dougherty ·95 to 1·09 for impending delivery,
and ·9 to 1·30 for maximum efficiency.
Sargent ·90 "for small discharges,"
1·10 for large discharges.

As the square root of $2g$ is 8·02, a value of unity for θ appears assumed in the above rate. It is evident that the result obtained by the formulæ is likely to be rather high for pump of "small discharge," and correspondingly low for "large discharges."

is less, more water will be delivered. The former condition is likely to prove serious, but the latter condition can always be controlled by throttling the flow and so getting the normal discharge.

The most important feature to observe in any pump diagram when the pump has to work against a variable head is to see that the break horse-power curve reaches its maximum when the efficiency curve is highest. This point naturally should occur when the pump is working under conditions for which it was designed. Pumps not designed for a variable head may show a stead rise in the H.P. curve after

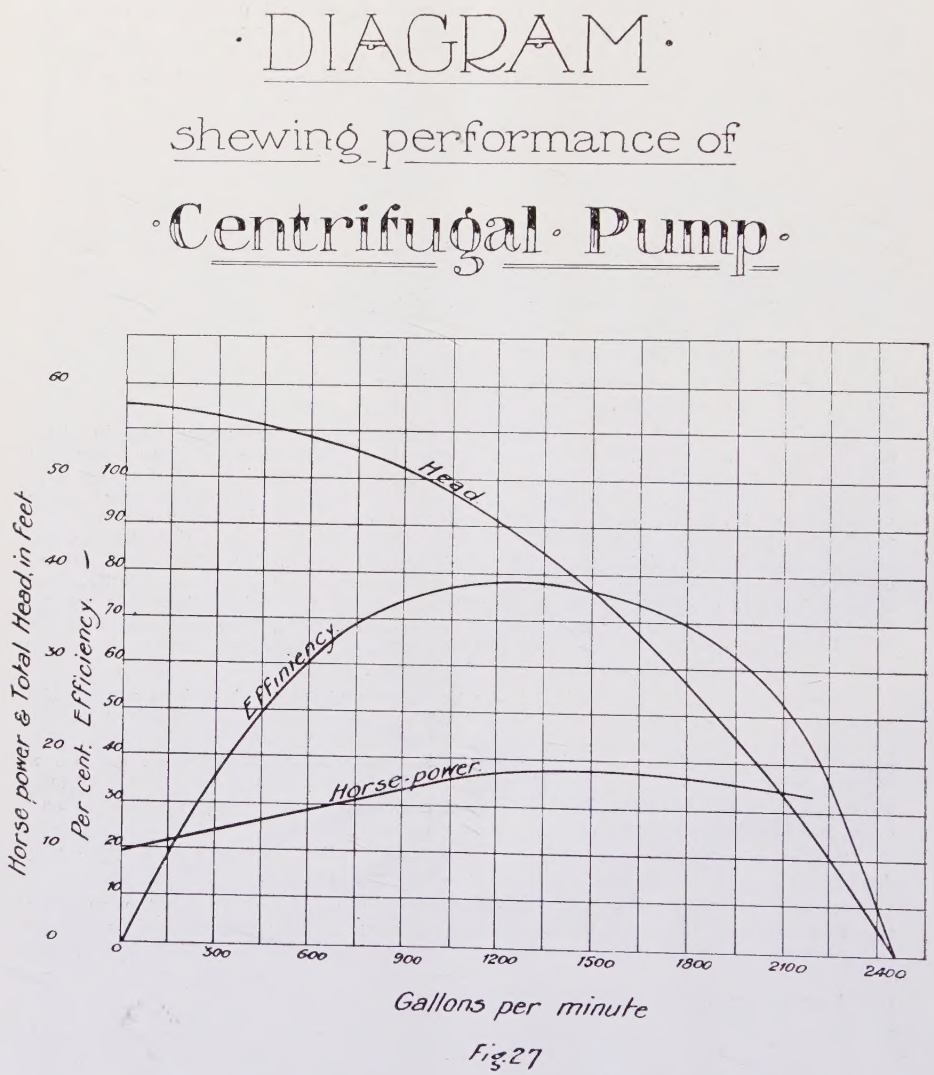


Fig. 27

the maximum efficiency has been reached, owing to an increase in the capacity due to a reduction in head. (See Figure 28.) Though this condition may be met by throttling the flow it is not a desirable feature. It is prohibitive where the motive power is an electric motor, and objectionable where an oil engine is used.

The only practical drawback to the centrifugal pump is that since it cannot lift water by suction unless its casing is filled with water it needs priming. There are many ways of doing this—as, for instance (1) by a small hand pump; (2) by having a foot valve on the suction end and some means of filling the pump by water,

either by hand pump or an overhead water tank; (3) where steam is used a flap is hung on the discharge end and an extractor steam nozzle is connected to the discharge main and supplied with steam from the boiler. (In the sugar-growing districts of this State the ejector is called "inspirator" as having reference to the drawing in of the water.)

In operating a centrifugal pump the precautions to be observed are—

1. Oil pump bearings well before starting, and if these are provided with grease cups examine these and refill if necessary.

2. See that the impeller revolves freely before starting.

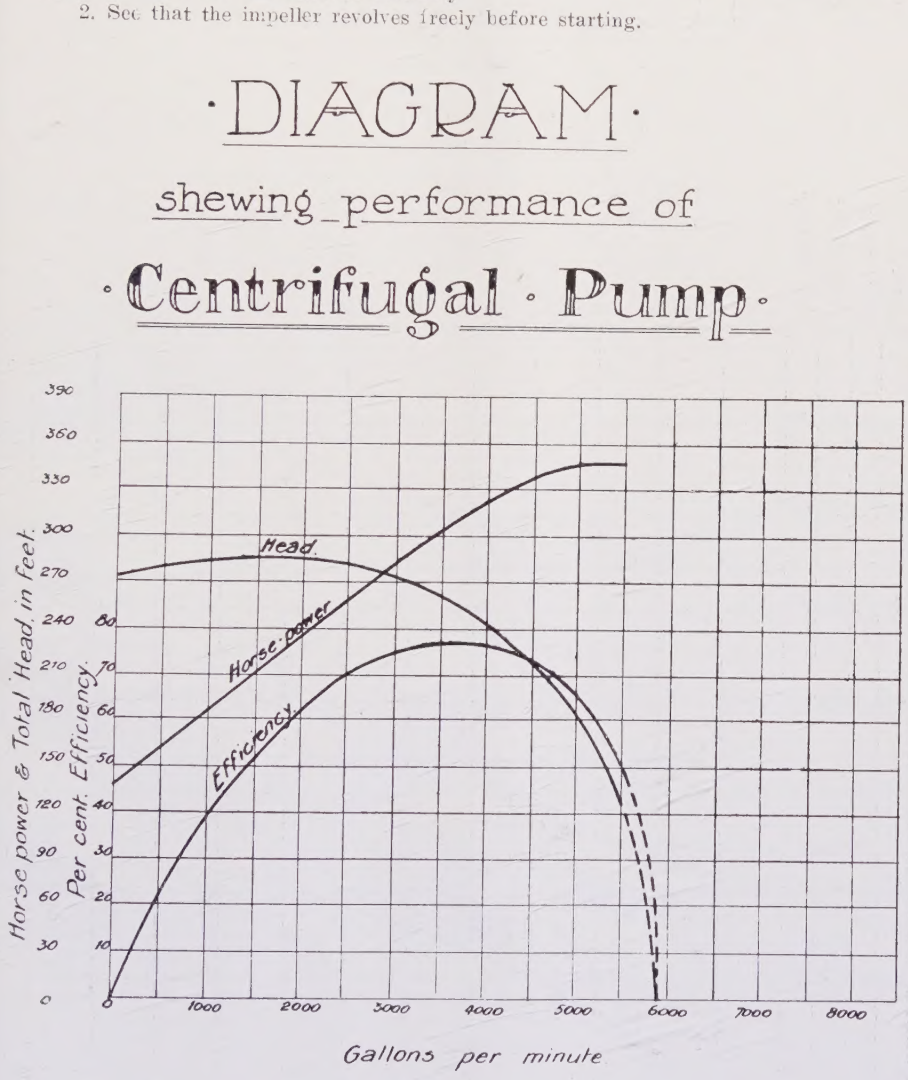


Fig 28

3. Do not draw up the packing glands so as to pinch the shaft. A small leakage, amounting to just a weep, will do no harm while it will help to keep the bearing cool and prevent seizure.

4. Do not start the pump until the casing is well filled with water, and if the suction exceeds 10 feet the water in the discharge pipe should be as many feet above the pump as the water level is below 10 feet to ensure a good start.

5. Do not run the pump empty.

6. In running the pump, remember that overspeeding gives less loss of efficiency than under-speeding, but every endeavour should always be made to maintain the correct speed.

7. The larger the pump the better should be the efficiency. Small pumps may give from 40 to 50 per cent. efficiency, whilst large pumps sometimes show over 75 or even 80 per cent. (See Table XI. for capacities and speeds.)

Test Curves for Pump.

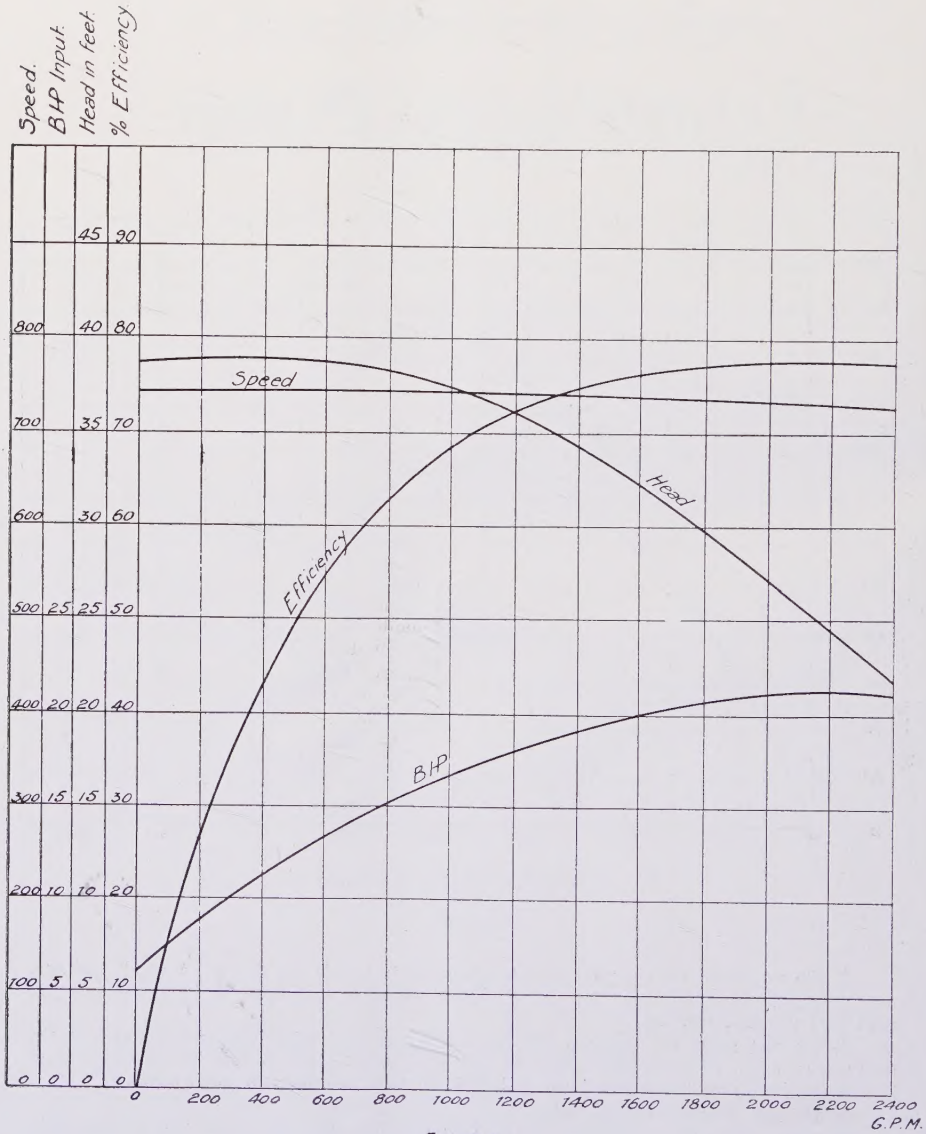


Fig 29.

II.—Stored Supplies.

Where it is necessary to store or conserve water to provide a supply for irrigation, the undertaking may easily be too costly to be profitable for the individual farmer. It is here that the legislative measures of the Water Rights Act of 1910 provide for a special benefit.

There exist, however, many places in Queensland where the natural facilities are such that but very little labour is needed to ensure a good supply. Any such contemplated improvement should, however, be approached with a certain amount of caution, as enthusiasts are liable to overrate the practical utility of any natural facilities that exist.

The following notes are made as a guide to the farmer in getting an idea of the amount of storage necessary to tide him over a bad period, where such storage is his only hope. It is not recommended that any actual work be undertaken without advice by some competent engineer, having had experience in water conservation work.

In the first place the least amount that could be depended upon to raise a crop, rainfall included, is about 30 inches of water per acre per annum. To allow for evaporation and seepage it will be best to take it that this quantity has to be provided by the stored supply only; the rainfall being neglected for purposes of arriving at a safe estimate of the quantity of stored water needed.

Taking, say, 50 acres as the amount of land for which it is desired to provide a supply sufficient for irrigation, it will be interesting to make some comparison as to the bulk of water required. One acre foot, it will be noted from tables that will follow the final instalment of this series, is equal to 43,560 cubic feet. An ordinary six-roomed house, if filled with water, would contain about one-quarter of this amount. If it were put into a cube just large enough to contain it, this cube would measure just over 35 feet each way. The actual supply required for one year is 150 times this amount, and as droughts sometimes last for more than eighteen months it is best to consider that a two years' supply may be needed. A two years' supply at three acre feet per acre for 50 acres is 300 acre feet, or 13,670,000 cubic feet. The size of a cube containing this amount of water would measure roughly 505 feet each way. If a dam 20 feet in height is put across a creek 100 feet wide (the banks being even and steep) and the water backs up along the creek for three miles, the contents of this dam, when full, will be a little more than 360 acre feet, or a sufficient quantity for 60 acres on basis of above estimate of requirements. Such a dam would require about 4,500 cubic yards of earth for its construction, and the cost may be anything from £500, at the least, to perhaps £1,500 at the most. Putting down £800 for an engine and pump and another £300 to £500 for piping and other things needed, we have an amount somewhere between £1,600 and £2,800 as the probable cost of providing a supply for 60 acres, if facilities are good and material needed for construction handy.

The interest on the greater of these amounts at 7 per cent. is £196 per annum, or nearly £4 per week. When a fluctuating market, transportation, agents' fees, working expenses and maintenance are considered, there is nothing particularly fascinating about such a proposition to the individual.

But irrigation is intense culture and 20 acres well looked after can probably be made to yield as much profit as 60 acres indifferently tilled. It will be worth while, therefore, to look at this proposition from another point of view. Say that three farmers are so situated that they could each in turn take advantage of the supply and plant. The cost to each would, in such a case as stated above, be less than £1,000. Again, if the works and machinery were constructed on the principle of Water Supply Areas under the Water Rights Act of 1910, the annual liability to the Crown of each participant in the scheme would only be an amount of interest and sinking fund depending on the period fixed for redemption of the loan plus his share of the maintenance and working expenses. The period is determined by the probable life of the works, and assuming that this could be put down at twenty-eight years, interest and sinking fund would amount to 6 per cent. per annum. If the period were fixed at less than this time the annual payments would, of course, be larger; but the total cost to the shareholders would be less on account of the reduction in time during which he has to pay interest. The machinery necessary could hardly be expected to last twenty-eight years even if the rest of the work might. The period may, therefore, have to be divided according to the class of work it covers, and in addition a renewal fund should be provided so that the machinery could be renewed without the necessity for having to obtain another loan.

It is just here that a little further caution may be necessary. The Victorian Settlement (Mildura), although situated on a river (where water transport was and is in operation), suffered considerably from a lack of rapid transportation facilities. If the farmers' cost of transport is high, it is necessary, therefore, to consider whether intense culture is going to pay him or the produce merchant or the

railways best. When rural communities are organised on co-operative lines and agents' fees obviated, there will probably be money to spare for experiments. It is chiefly due to the strength of the co-operative body in Mildura that the producers have received rather more than the usual pittance for their labours. In Queensland it is not uncommon to hear the farmer complaining that he has received only between 10 and 50 per cent. of the price that the consumer pays. If this is so, it would be interesting to know where the balance goes; but as this is a matter that concerns the farmer most, it is, as the American says "Up to him."

The next instalment will deal with "The Duty of Water."

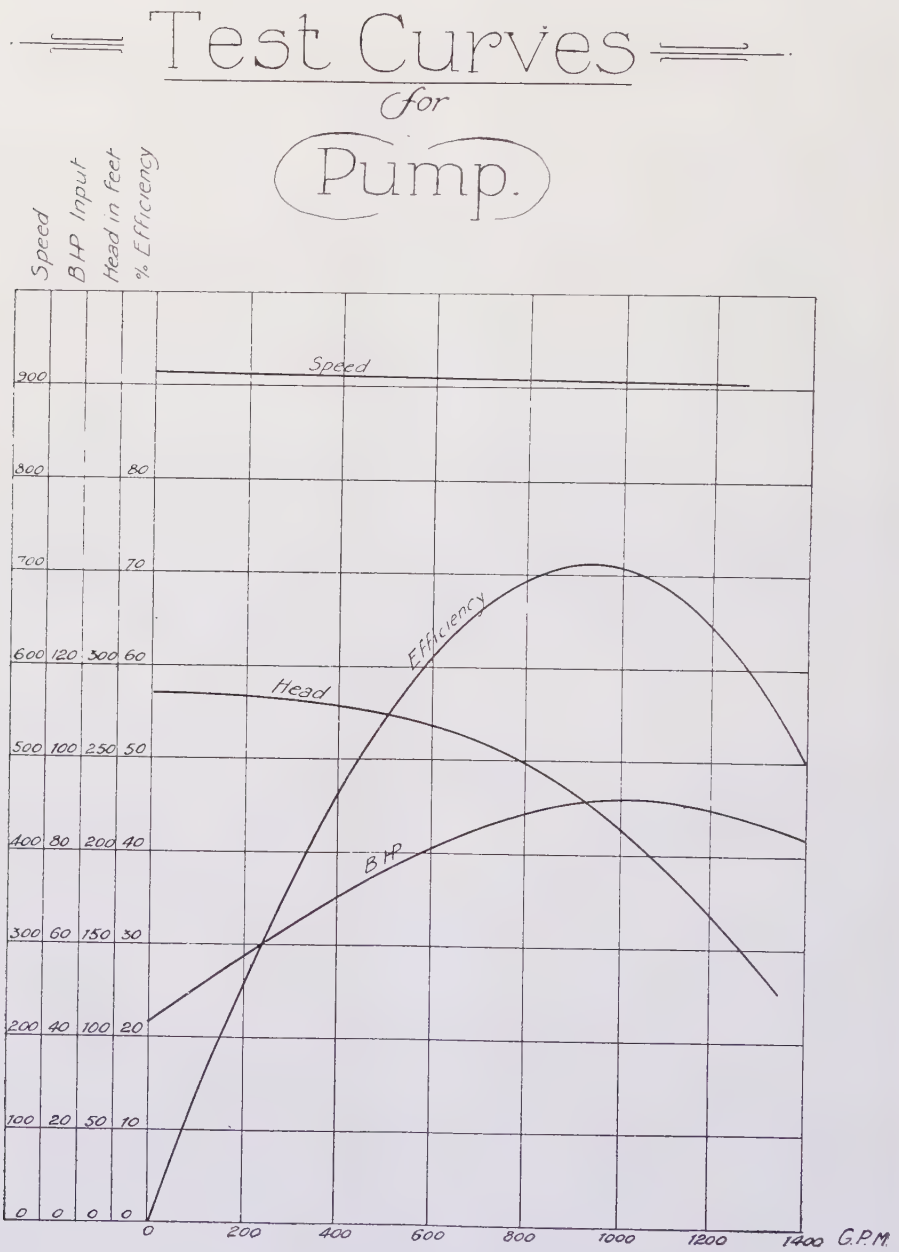


Fig. 30

CLASSIFICATION OF PIGS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

The first of a series of articles on pig breeding and feeding, and covering other points in practical animal husbandry.

To secure the maximum profit in the marketing of pigs it is necessary that they be properly fattened on suitable fattening foods, that they be "topped up" prior to actual despatch, and that they be correctly classified and graded.

The following table which sets forth the names, ages, approximate weight and value of market pigs will be found very useful in connection with the preparation for market or for the factory of every description of pig which the farmer will be handling in this State. The figures given are approximate only and are quoted merely as a guide. The demand for pigs of all ages and classes is rapidly increasing, and whilst values fluctuate a good deal, it can be taken as a general rule that the medium weight animal, whether he be marketed as a porker or bacon pig, is the one most in demand and under normal conditions is the most profitable.

MARKET CLASSIFICATION.

Name of Animal.	Approximate Age.	Approximate Weight.	Approximate Value November, 1923.
Sucker or Sucking Pig	6 weeks	15 lb. dressed	12s. 6d. to 15s.
Weaner	8 weeks	25 lb. alive	15s. to 20s.
Slip	10 weeks	32 lb. alive	20s. to 25s.
Store	12 to 16 weeks	45 lb. alive	20s. to 30s.
Light Porker ..	4 months	50 lb. dressed	40s. to 55s.
Medium Porker ..	4½ to 5 months	70 lb. dressed	50s. to 75s.
Heavy Porker ..	5½ to 6½ months	95 lb. dressed	65s. to 80s.
Light Baconer ..	5½ to 6½ months	95 to 100 lb. dressed	65s. to 80s.
Medium Baconer ..	6 to 7 months	120 to 125 lb. dressed	85s. to 95s.
Heavy Baconer ..	7 to 10 months	Up to 180 lb. dressed	90s. to 125s.
Backfatter	Up to 7 years	Up to 5 cwt. dressed	Up to £15
Stag	Up to 5 years	Up to 4 cwt. dressed	£3 to £5
Boars	Over 6 months	Various weights	From £1 upwards
Choppers	Up to 2 years or more	Up to 3 cwt. dressed or more	Up to £10

GENERAL DESCRIPTION OF MARKET AND STUD PIGS.

Sucker or Sucking Pigs.

This is a trade class and includes pigs up to six or even eight weeks old, in good marketable condition, and fit for immediate slaughter as "sucking pig" for the week-end or Christmas menu. The demand for this class varies considerably, and is not sufficiently constant to warrant being specially catered for by the average farmer. Pig breeders having this class of pig for sale at Christmas can usually dispose of them at remunerative prices with but little trouble. The most popular weight is 15 lb. dressed, although some customers ask for lighter or heavier weight carcases. In general the difference between actual live and dressed weight varies from about 18 to 25 per cent., though most factories find it necessary to deduct heavier percentages than these in ordinary routine work.

Weaners.

Pigs are usually weaned off the sows at eight weeks of age. At this age they are sufficiently advanced (or at least they should be) to be able to care for themselves. They should be taught to feed from a trough when five to six weeks old, they will then be quite accustomed to their own food trough by the time they leave their mothers. Weaners are not a "trade" class, and butchers do not handle them except as "stores."

Slips.

After having been weaned, the young pig next becomes a "slip." This is purely a stock salesman's term indicating that the pig is midway between the weaner and store stage. Many farmers prefer to buy slips or stores and to fatten

them for market in preference to breeding them. Thus it is that there is usually a fairly keen demand for slips and stores, and it often happens that they realise more in comparison than pigs that have already been fattened. A "slip" is not a butcher's pig and butchers do not handle them except for sty purposes. The price varies with the demand, but they should be worth from 20s. to 25s. if they have been well cared for from birth and are well bred.

Stores.

The demand for pigs for fattening purposes continues to increase annually, and provided that store pigs are in good healthy growing condition and show some breeding and quality, they can usually be disposed of to advantage by public auction or private contract at prices varying from 20s. to 30s. or even 40s. each. Store pigs to realise the maximum value must be perfectly healthy, show good quality and type, and be in good condition for fattening; any that are "weedy" or that have been injured in any way should not be offered for sale as they will always affect the value of the other pigs offered or of the better class pigs. Suburban pig farmers are constantly on the look out for good lines of store pigs. They have no objection to the size or age of the pigs, except that they will not handle weaners or slips if larger pigs are available, and the stores they like most are those from five to six months old that with three or four weeks' fattening will "make up" into first-class baconers. For these latter sorts they will frequently pay more in comparison than the farmer can realise for porkers.

Light Porkers.

Pigs varying from four to six months old are usually classed as porkers, and they are graded according to weight and condition into three groups—light, medium, and heavy. There is a fairly constant demand for porkers and they usually realise very satisfactory prices, but it is a mistake to send porkers to the bacon factory and expect the factory manager to grade them as bacon pigs and pay for them accordingly. Porkers should be sold to buyers handling these lines. If they are properly handled they should be more profitable than bacon pigs, as they are ready for market much earlier and consequently can be produced at a cheaper rate and with less risk. The lighter grades of porkers, say, those dressing about 50 lb. weight, are not as profitable as the medium weight pigs, except to the suburban farmer who can deliver them to the saleyards or to the buyers in a fresh, clean condition. Porkers cannot stand knocking about to the same extent as pigs carrying more age and weight. To the farmer having porkers for sale, the best advice would be to spend some time moving about amongst pork butchers or buyers or stock agents, ascertaining the exact position regarding the market outlet for these animals.

Medium Weight Porkers.

For pigs of prime quality and condition weighing about 65 to 70 lb. dressed there is, especially during the cooler months of the year, a good demand; they are more profitable than either the lighter or the heavier grades, and provided that they are in good healthy condition will always realise payable prices. Butchers prefer porkers weighing 65 lb. dressed if they can secure them because they are of a convenient and handy "shop" size, and can be "cut up" to more advantage than other grades. Porkers are, of course, used in the fresh meat business, being retailed in the form of small joints of fresh pork, pork chops, and other forms. Many farmers believe that the bacon curer can do with a few porkers to cut up for the sausage trade, but this is not the case as bacon factory reports will bear out.

Heavy Porkers.

For these the demand is not so keen, nor are prices so satisfactory. Altogether they are not as good for marketing purposes as are the medium weight porkers or the better grades of bacon pigs. There are times, of course, when heavy porkers sell well, particularly if one or more of the carcase butchers have heavy export orders for carcase pork for the Navy or for pickled pork for the "Island" trade. In general, however, it can be said that the heavy porker is not in demand; he had better be fed for a month longer and be marketed as a baconer in which class he will realise a price that will more than pay for his keep for the extra period. This is a point far too many farmers fail to realise, the general complaint amongst bacon curers to-day is that the farmers are rushing their pigs into market before they are heavy enough or carry sufficient condition for curing.

Plate 89.—A Group of Slips.

The Berk-Yorkshire type enjoying the run of an open paddock.

Plate 90.

What can be done by care and attention to an "orphan" pig, for brood sows sometimes have trouble at farrowing and are unable to rear their suckers.

Bacon Pigs—Light, Medium, and Heavy.

As with porkers, the demand for bacon pigs centres more upon the medium weight pigs than upon the lighter or heavier grades. In fact, the very light bacon pig, like the over-weight porker, is not desired. A pig that is too heavy for the pork butcher, yet not heavy enough for the bacon curer, is in a class that is likely to suffer more on a falling market than any other grade, therefore breeders should aim at placing their bacon pigs on the market when they are six to seven months old, and about 120 to 125 lb. dressed weight. The bacon curers prefer a pig of this size because he can be retailed more profitably in the form of hams, shoulders, flitches, middles, or sides. The heavy bacon pig is a better market animal than the heavy porker because the former carries a more weighty ham, but he is not as profitable "all round" as the pig of medium weight and should not be kept so long in the fattening pen. It must always be remembered that the pig is a greedy feeder, and so long as he is feeding he is either doing so at a profit or at a loss to his owner. It pays handsomely to watch the markets carefully and to place before buyers the class of stock most in demand. The demand for the bacon pig is keen, so much so, that bacon curers' have buyers or agents operating in practically every district throughout the State, the competition is so keen that the farmer need have no fear that his stock will not realise satisfactory values. Good pigs always realise good values.

Plate 91.—A Record-Priced Backfatter.
This sow realised £21 1s. at a Southern public auction.

Backfatters.

The term "backfatter" is used by pig men to indicate that the pig has passed the stage at which he can profitably be handled as a bacon pig, and that having passed that stage his carcase must be "cut up" into smaller pieces and be used in the manufacture of the variety of small goods for which the carcase of the pig is justly famous. The term "backfatter" also indicates that the pig is a very heavy one, and that he carries the greater portion of his fat on his back or on the upper portions of his body. Backfatters fluctuate in value more than any other grade of pig, and as a class they can fairly be considered as unprofitable; still the class embraces a variety of heavy pigs, old fat sows, barrows, and very heavy bacon pigs that for various reasons might not have been marketed earlier. It would not pay under ordinary circumstances to breed pigs for sale as backfatters, but it certainly pays to fatten up brood sows that have become unprofitable, either on account of age or because they are unsatisfactory as breeders; it pays to cull and fatten up any sow that fails to produce a satisfactory litter twice a year, therefore the backfatter class provides a suitable market outlet for old heavy pigs or for fat pigs over the ordinary market weights. The price varies considerably according to supply and demand and the quality and condition. During the past year or two prices have been paid for backfatters up to as high as £22 15s. This price having been paid for a fat sow for slaughter in New South Wales. Prices varying from £12 to £18 have been fairly common, and whilst these prices might be considered phenomenal, as indeed were prices for all descriptions of pigs last year, backfatters still realise very high figures.

PLATE 92.—BACONERS ON THE WAY TO THE FACTORY.
Note the fine quality and evenness of type. These pigs, though heavier than our markets require, are of a type much in demand throughout Queensland.

Stags.

Old sows are usually graded as backfatters, whilst old boars that have been castrated and fattened up are classed as "stags" and for them the demand is very limited. Stags are purchased for rendering-down mostly, the fat goes into the manufacture of lard, the lean meat goes to the sausage tub, and most of the heavy gristly skin (the shield and the wrinkly skin along the neck and sides) is cut away by the meat inspector and is condemned as unfit for human consumption. "Aged" stags rarely pay for the feed they consume.

Boars.

It does not pay to market old boars unless one has an abundant supply of very cheap food, they rarely realise more than from £1 to £3, and they will only realise these prices if they are comparatively prime and in good condition. Whether it would pay to castrate them and fatten and market as stags is a very debatable point and one that can only be answered by the owner. It would not pay to fatten them upon purchased foods unless the food was very cheap and the market rates of pigs reasonably high.

Choppers.

Pigs that are marketed in a half-fat condition and that are unsuited to the requirements of the pork butcher, or the bacon curer, or for use as backfatters, are usually classed as "choppers," the term indicating that they are purchased for chopping purposes; that is, the carcase is chopped up into a variety of pieces and is used either for export as salt pork or pickled pork, or is used in the manufacture of small goods. Choppers vary in price according to their weight, condition, and quality. The class includes all grades of pigs from light weight porkers to heavy backfatters, and provides a very useful market outlet for a variety of pigs that could not be marketed profitably in the classes for which they might otherwise be suited.

OTHER STOCK TERMS REFERRING TO PIGS.

Apart from the general classification of pigs for trade and market purposes, there is a breeding classification in which other terms are used to describe the pigs at different stages of growth.

Commencing at birth the young pig is variously known as a sucker, a pigling, a bonham, a piglet; or in a group, he is part of a farrow or litter.

The Yelt.

Having passed the sucker stage the young female pig is called a "Yelt" or "Gilt" until she has produced her first litter.

The Brood Sow.

Having produced a litter, the yelt now becomes one of the matrons of the herd, and is henceforth known as a brood sow or as a breeder or breeding sow.

The Male Pig.

The boar usually retains his title throughout life. The male is often termed the "hog," but in America all pigs are called "hogs" (*i.e.*, The Hog Industry); in fact, the Americans rarely use the term "pig" at all, and when they do use it, it is to describe suckers or very young stock. The boar does not actually begin his stud duties until he is ten to twelve months old, the sow also should be at this age before being mated.

The Barrow Pig.

A male pig castrated whilst young is styled a "barrow." In American literature again both boars, barrows, and sows at the age of about four or five months are styled "shoats," but here they are called "store" pigs, and the term is a general one including all grades; a group of store pigs often includes breeding sows in poor or rough condition, in fact the group might include any class of pig in poor or half-fat condition.

Runts.

The "runts" of a litter are the small weedy or weakly pigs. They often do not pay for rearing as they require too much special care and attention.

Rickety Pigs.

Pigs that suffer as a result of a long train or steamer journey and that arrive at the saleyards or factories "down" in the hindquarter, or that are unable to walk, or that walk with difficulty, are usually styled "rickety" or "groggy" pigs. The term is an erroneous one so far as its reference to the disease called "rickets" is concerned, although pigs suffering from rickets exhibit much the same symptoms.

PLATE 93.—BACONERS READY FOR THE CURER.

Scrub or Mongrel Pigs i.e., the "Razorback" of American Literature.

A scrub or mongrel is an animal of mixed or unknown breeding without any definite type or markings. Other terms used to describe mongrels are "bronchos," "razorbacks," "wild pigs," "bush pigs," etc.

Purebred, Pedigreed, or Stud Pigs.

An animal that is included in this class is one of pure breeding, representing a definite, recognised breed, both of whose parents were pure-bred animals of the same breed. To be classed as pure-bred, live stock must be either registered, eligible for registration, or (in the absence of public registry for that class) have such lineage that its pure breeding can be definitely proved and recorded. To be of good type and quality, the animal must be healthy, vigorous, and a creditable specimen of its breed; its breeding must be pure.

Thoroughbred.

In speaking of pigs the term "thoroughbred" means the same as pure-bred. In American and English literature the term "standard bred" is also largely used. This is a term that we rarely use at all, it refers to the pure-bred animal.

PLATE 94.—"HOG HEAVEN." ENJOYING A DIP.
Careful handling of Pigs in transit is of prime importance in relation to top market rates.

Crossbred.

This term applies to the progeny of pure-bred animals of different breeds: that is a Berkshire boar mated to a Tamworth sow produces crossbred pigs, both parents are pure-bred pigs but of different breeds. The crossbred pig is very popular as a "meat" pig, and is produced for market purposes in practically every district where pigs are bred. Crossbred males should be castrated, they should not be permitted in the herd as sires. The crossbred sow on the other hand makes an excellent breeding sow when mated to a pure-bred boar.

Grade.

This term differs from that referred to above, in that it is applied to the progeny of a pure-bred boar mated to a crossbred sow. Sometimes the term "grade" is used where the progeny are from parents whose breeding is pure, but whose pedigrees for various reasons have not been recorded. The offspring of a pure-bred boar and a grade sow is also a grade, but through progressive breeding becomes a higher or a better grade. When a Berkshire boar is mated to a crossbred Tamworth-Berkshire sow the progeny are called grades. A sow of the latter class mated back to a Berkshire boar frequently produces progeny to all appearances pure-breds; they are sometimes called three-quarter breds, having as it were three-quarters Berkshire and one-quarter Tamworth blood in their veins.

Next month's article will deal in detail with the characteristics of the Berkshire.

REPORT ON EGG-LAYING COMPETITION—QUEENSLAND AGRICULTURAL COLLEGE, SEPTEMBER, 1923.

The adverse winds during the month hampered the laying of the competition birds to a small extent. Rain was badly needed for producing the necessary green feed, milk thistles being substituted. The best scores for the month in the light breeds were W. and G. W. Hindes 163, and C. H. Singer 161. In the heavy breeds Mr. James Potter scored 151, and Mr. J. Ferguson 148. Mr. R. Burns's E. bird made a sequence of 37 eggs. The heavy breeds were very troublesome with broodiness; there were also a few cases among the light breeds. Records and weights:—

Competitors.	Breed.	Sept.	Total.
LIGHT BREEDS.			
*C. H. Singer	White Leghorns	161	792
*W. and G. W. Hindes	Do.	163	770
*N. A. Singer	Do.	160	765
*Oakleigh Poultry Farm	Do.	147	700
*Ancona Club	Anconas	135	693
*S. L. Grenier	White Leghorns	126	685
*Beckley Poultry Farm	Do.	128	650
*Rock View Poultry Farm	Do.	119	642
*Mrs. L. Andersen	Do.	131	640
F. Sparsholt	Do.	121	637
*O. Goos	Do.	120	635
*J. W. Newton	Do.	126	628
*H. P. Clarke	Do.	144	626
*J. M. Manson	Do.	129	622
*R. C. J. Turner	Do.	133	618
*J. W. Short	Do.	116	604
*G. Williams	Do.	132	603
*Bathurst Poultry Farm	Do.	125	597
Jas. Hutton	Do.	100	597
*Arch. Neil	Do.	133	592
*C. A. Goos	Do.	133	577
G. Marks	Do.	115	574
*Mrs. R. E. Hodge	Do.	126	569
*A. C. G. Wenck	Do.	121	563
G. E. Rogers	Do.	106	555
*H. Fraser	Do.	120	551
Jas. Harrington	Do.	103	539
W. A. and J. Pitkeathly	Do.	104	529
W. Becker	Do.	114	529
*J. Purnell	Do.	127	516
C. Quesnell	Do.	102	507
W. and G. W. Hindes	Brown Leghorns	102	502
Jas. Earl	White Leghorns	104	496
Chapman and Hill	Do.	102	495
E. Ainscough	Do.	116	487
*Mrs. E. White	Do.	109	484
*N. J. Nairn	Do.	117	465
Parisian Poultry Farm	Do.	101	454
HEAVY BREEDS.			
*W. Becker	Chinese Langshans	143	735
*R. Burns	Black Orpingtons	146	727
*Jas. Potter	Do.	151	704
*Jas. Ferguson	Chinese Langshans	148	703
*Mrs. A. E. Gallagher	Black Orpingtons	138	679
*Jas Hutton	Do.	137	678
J. R. Douglas	Do.	113	641
*E. Walters	Do.	127	631
*Mrs. A. Kent	Do.	124	627

EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE—*continued.*

Competitors.	Breed.	Sept.	Total.
	LIGHT BREEDS—*continued.*		
*Parisian Poultry Farm	Black Orpingtons	139	622
*E. F. Dennis	Do.	121	617
*T. Hindley	Do.	129	607
W. T. Solman	Do.	124	605
*H. M. Chaille	Do.	118	604
*R. Holmes	Do.	127	594
R. Conochie	Do.	107	591
Beckley Poultry Yards	Do.	120	557
*C. C. Dennis	Do.	130	553
*J. H. Jones	White Wyandottes	131	552
G. E. Rogers	Black Orpingtons	123	550
Rev. A. McAllister	Do.	115	532
W. F. Ruhl	Do.	123	524
H. B. Stephens	Do.	124	517
Jas. Ferguson	Plymouth Rocks	101	508
W. G. Badcock	Chinese Langshans	102	478
V. J. Rye	Black Orpingtons	110	465
F. J. Murphy	Do.	125	402
Jas. Ferguson	Rhode Island Reds	101	364
Mos. Stephens	Black Orpingtons	101	342
Totals		8,269	39,197

* Indicates that the pen is being single tested.

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total.
			LIGHT BREEDS.				
C. H. Singer	120	164	131	113	125	139	792
W. and G. W. Hindes	116	136	121	114	142	141	770
N. A. Singer	114	135	141	135	121	119	765
Oakleigh Poultry Farm	132	123	109	109	124	103	700
Ancona Club	107	120	141	95	109	121	693
S. L. Grenier	104	116	126	113	117	109	685
Beckley Poultry Farm	114	95	89	112	121	119	650
Rockview Poultry Farm	116	125	110	108	92	91	642
Mrs. L. Andersen	82	116	120	120	99	103	640
O. Goos	99	111	116	105	94	110	635
J. W. Newton	113	111	100	83	106	115	628
H. P. Clarke	116	76	117	98	111	108	626
J. M. Manson	102	93	124	121	99	83	622
R. C. J. Turner	99	105	103	103	91	117	618
J. W. Short	100	96	105	111	108	84	604
Geo. Williams	113	115	86	93	103	93	603
Bathurst Poultry Farm	102	105	89	111	102	88	597
Arch Neil	88	97	80	113	118	96	592
C. A. Goos	99	115	83	100	85	95	577
Mrs. R. E. Hodge	89	96	86	107	101	90	569
A. C. G. Wenck	97	82	92	100	85	107	563
H. Fraser	99	82	88	86	98	98	551
J. Purnell	90	79	93	74	102	78	516
Mrs. E. White	70	78	98	89	79	70	484
N. J. Nairn	90	62	88	79	73	73	465

DETAILS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
HEAVY BREEDS.							
W. Becker	127	132	129	120	122	105	735
R. Burns	131	105	117	111	166	97	727
Jas. Potter	101	130	113	117	107	136	704
Jas. Ferguson	124	130	110	114	114	111	703
Mrs. A. E. Gallagher	109	121	113	115	109	112	679
Jas. Hutton	121	118	123	108	109	99	678
E. Walters	128	130	93	95	89	96	631
Mrs. A. Kent	96	135	92	132	91	81	627
Parisian Poultry Farm	72	100	107	119	116	108	622
E. F. Dennis	118	109	97	100	99	94	617
T. Hindley	105	116	116	110	84	76	607
H. M. Chaille	100	116	109	107	83	89	604
R. Holmes	84	86	102	96	108	118	594
C. C. Dennis	96	104	66	100	89	98	553
J. H. Jones	94	98	103	93	64	100	552

WEIGHT OF EGGS, SINGLE HEN PENS.

—	A.	B.	C.	D.	E.	F.	Average
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
LIGHT BREEDS.							
S. L. Grenier	2 1/8	2	2	2 1/8	2 1/8	2 1/8	2 1/8
H. P. Clarke	2 1/8	2 1/8	2 1/8	2 1/8	2	2	2 1/8
G. Williams	2	2	2	2 1/4	2	2 1/8	2
W. and G. W. Hindes	2 1/8	2 1/8	2 1/4	2 1/8	2 1/8	2	2 1/8
C. H. Singer	2 1/4	2 1/4	2 1/4	2	2 1/8	2 1/4	2 1/8
N. A. Singer	2 1/4	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8
H. Fraser	2 1/8	2 1/4	2 1/8	2	2 1/8	2	2 1/8
Arch. Neil	2 1/8	2	2	2	2 1/8	2 1/8	2 1/8
J. M. Manson	2 1/8	2 1/8	2	2	2 1/4	2 1/8	2 1/8
Mrs. R. E. Hodge	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8
N. J. Nairn	2 1/4	2 3/8	2 1/8	2 1/4	2	2 1/8	2 1/8
J. W. Short	2 1/8	2	2	2 1/8	2 1/8	2	2
Bathurst Poultry Farm	2 1/8	2 1/8	2 1/8	2	2	2 1/4	2 1/8
A. C. G. Wenck	2 1/8	2	2 1/8	2 1/8	2 1/4	2	2 1/8
C. A. Goos	2 1/8	2 1/8	2 1/4	2 1/8	2 1/8	2 1/4	2 1/8
J. Purnell	2	2	2 1/4	2	2	2 1/4	2 1/8
Mrs. L. Andersen	2 1/8	2 1/4	2	2 1/8	2 1/8	2	2 1/8
O. Goos	2	2	2	2	2	2	2
Rock View Poultry Farm	2	1 1/8	2 1/8	2 1/4	2 1/8	2 1/8	2 1/8
E. White	2	2 1/8	2 1/4	2 1/8	2	2 1/8	2 1/8
Ancona Club	2 3/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/4	2 1/4
R. C. J. Turner	2	2 1/8	2 1/8	2	2 1/4	2 1/8	2 1/8
Beckley Poultry Farm	2	2	2	1 7/8	2	2	2
J. W. Newton	2	2	2 1/8	2 1/8	2 1/8	2	2
Oakleigh Poultry Farm	2	2 1/8	2 1/4	2 1/8	2 1/8	2 1/8	2 1/8
HEAVY BREEDS.							
J. H. Jones	2 1/8	2	2 1/8	2	2 1/4	2	2 1/8
E. Walters	2 1/8	2 1/8	2 1/8	2 1/8	2	2 1/8	2 1/8
Jas. Potter	2 1/8	2 1/8	2 1/4	2	2 1/8	2 1/4	2 1/8
Parisian Poultry Farm	2 1/8	2 1/8	2 1/8	2	2	2 3/8	2 1/8
Jas. Ferguson	2 1/8	2 1/4	2 1/8	2 1/8	2 1/8	2 1/4	2 1/8
R. Holmes	2 1/8	2 1/8	2	2 1/8	2	2	2

WEIGHT OF EGGS, SINGLE HEN PENS—*continued.*

—	A.	B.	C.	D.	E.	F.	Average.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
HEAVY BREEDS—*continued.*							
Jas. Hutton	2 1/8	2 1/8	2 1/4	2 3/8	2 1/8	2 3/8	2 1/4
R. Burns	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4
Mrs. A. E. Gallagher	2	2	2	2	2	2 1/8	2
E. F. Dennis	2	2	2 1/8	2 1/8	2 1/8	2	2 1/8
T. Hindley	2 1/8	2 1/8	2	2 1/8	2 1/8	2	2 1/8
C. C. Dennis	1 7/8	1 7/8	2	1 7/8	1 7/8	1 7/8	1 7/8
Mrs. A. Kent	2	2	2 1/8	2	2 1/8	2 1/4	2 1/8
A. Chaille	2 1/4	2 1/8	2 1/4	2 1/4	2 3/8	2 1/4	2 1/4
W. Becker	2 1/8	2 1/8	2	2	2 1/8	2 1/8	2 1/8

GROUP PENS.

LIGHT BREEDS.

—	Average Weight.	—	Average Weight.
	Oz.		Oz.
Jas. Earl	2 1/8	G. E. Rogers	2 1/8
G. Marks	2	G. Ainscough	2 1/8
Jas. Harrington	2 1/8	F. Sparshott	2
Parisian Poultry Farm	2	Hill and Chapman	2 1/8
W. A. and J. Pitkeathly	2	Jas. Hutton	2
C. Quesnell	2	W. Becker	2
W. and G. W. Hindes	2		

HEAVY BREEDS.

R. Conochie	1 3/4	Beckley Poultry Farm	2 1/8
J. Ferguson (R.I.R)	2 1/8	V. J. Rye	1 7/8
W. G. Badcock	2 1/8	J. Ferguson (P.R.)	2
Mos. Stephens	2 1/8	W. T. Solman	2
G. E. Rogers	2	Rev. A. McAllister	2 1/8
F. J. Murphy	1 7/8	W. F. Ruhl	2
H. B. Stephens	2 1/8	J. R. Douglas	1 7/8

P. M. PITT,
Acting Principal.

N.U.P.B.A. COMPETITION, ZILLMERE.

During the month of September 3,029 eggs were laid, an average of 23 eggs per bird. One death occurred, a White Leghorn, the property of Mr. Duff (No. 65), due to rupture.

Nos. 100, 115, and 116 were reported broody during the month.

WHITE LEGHORNS.

Pen.	Owner.	Sept.	Total.	Pen.	Owner.	Sept.	Total.
62	Miss L. M. Dingle	28	u159	65	R. Duff	22	131
14	Enroh Pens	27	u147	27	H. T. Britten	23	u130
75	W. Shaffrey	24	u145	64	S. Lloyd	26	130
15	W. J. Berry	24	u138	33	A. S. Walters	25	128
8	Oakleigh P. Farm	23	137	13	Enroh Pens	25	127
72	W. H. Forsyth	27	136	16	W. J. Berry	24	u126
50	J. Harrington	24	132	22	M. F. Newberry	24	126
54	H. Holmes	27	u132	61	Miss L. M. Dingle	23	126
66	R. Duff	24	132	4	T. H. Craig	27	125

N.U.P.B.A. COMPETITION, ZILLMERE—*continued.*

White Leghorns—*continued.*

Pen.	Owner.	Sept.	Total.	Pen.	Owner.	Sept.	Total.
30	W. and G. W. Hindes	24	125	36	J. T. Webster	23	104
41	W. Wakefield	24	125	40	J. Earl	23	103
51	Kidd Bros.	24	125	78	W. Smith	25	103
18	A. W. Ward	24	124	11	A. Neil	23	102
81	J. E. G. Purnell	19	124	12	A. Neil	23	u102
28	H. T. Britten	25	123	23	Parisian P. Yards	25	100
49	J. Harrington	24	123	34	A. S. Walters	24	u98
59	G. Scaletti	26	122	56	G. Baxter	19	98
20	W. Witt	26	121	77	W. Smith	22	98
70	R. Shaw	25	121	83	L. Andersen	24	97
76	W. Shaffrey	21	120	35	J. T. Webster	22	96
3	T. H. Craig	24	119	25	E. Stephenson	21	u94
38	G. Williams	24	119	44	Kelvin P. Farm	25	94
43	Kelvin P. Farm	23	119	21	M. F. Newberry	28	91
84	L. Andersen	25	119	17	A. W. Ward	23	90
42	W. Wakefield	24	116	6	P. J. Fallon	22	89
69	R. Shaw	24	116	63	S. Lloyd	17	u88
29	W. and G. W. Hindes	24	u114	58	H. Fraser	24	u87
55	G. Baxter	21	114	46	F. R. Koch	22	85
73	A. Hodge	26	113	85	A. Cowley	21	85
1	Carinya P. Farm	23	112	24	Parisian P. Yards	23	84
7	Oakleigh P. Farm	24	112	32	H. Needs	23	84
71	W. H. Forsyth	23	112	5	P. G. Fallon	23	84
19	W. Witt	15	111	39	J. Earl	22	82
26	E. Stephenson	22	111	47	R. D. Chapman	26	80
45	F. R. Koch	23	111	67	J. and G. Green	20	79
48	R. D. Chapman	24	111	52	Kidd Bros.	27	74
53	H. Holmes	26	u110	79	W. Bliss	24	64
2	Carinya P. Farm	24	109	82	J. E. G. Purnell	23	61
10	R. C. J. Turner	23	u109	68	J. and G. Green	20	59
31	H. Needs	20	109	60	G. Scaletti	18	49
37	G. Williams	25	108	9	R. C. J. Turner	20	u47
57	H. Fraser	22	108	80	W. Bliss	9	35
74	A. Hodge	26	107	86	A. Cowley	5	28

Black Orpingtons.

Pen.	Owner.	Sept.	Total.	Pen.	Owner.	Sept.	Total.
95	J. Potter	27	165	105	W. Smith	23	111
92	J. Pryde	26	u151	93	H. B. Stevens	28	u110
109	T. Brotherton	28	143	87	Parisian P. Yards	25	109
113	E. Walters	26	138	118	E. C. Raymond	23	107
96	J. Potter	28	135	107	E. F. Dennis	12	106
112	H. M. Chaille	16	135	116	C. C. Dennis	16	105
115	C. C. Dennis	17	u135	114	E. Walters	26	u104
120	J. Harrington	24	134	106	W. Smith	23	100
89	K. Macfarlane	25	133	91	J. Pryde	22	u97
101	Enroh Pens	29	130	108	E. F. Dennis	18	97
119	J. Harrington	19	126	90	K. Macfarlane	27	92
104	L. Pritchard	20	125	94	H. B. Stephens	22	92
110	T. Brotherton	27	125	99	S. Donovan	21	86
111	H. M. Chaille	27	120	103	L. Pritchard	22	83
102	Enroh Pens	17	119	98	W. Shaffrey	26	82
117	E. C. Raymond	24	119	97	W. Shaffrey	24	62
88	Parisian P. Yards	29	111	100	S. Donovan	9	58

Other Breeds.

Pen.	Owner.	Sept.	Total.	Pen.	Owner.	Sept.	Total.
131	W. H. Forsyth (S.W.)	25	143	127	A. S. Walters (B.R.)	21	73
128	A. S. Walters (B.R.)	25	133	124	J. Ferguson (Anc.)	22	69
125	J. Ferguson (Lang.)	28	122	121	Parisian P.Y. (B.L.)	18	u61
126	J. Ferguson (Lang.)	21	122	130	R. A. Girling (Min.)	21	55
122	Parisian P.Y. (B.L.)	21	91	129	R. A. Girling (Min.)	22	44
123	J. Ferguson (Anc.)	22	81	132	W. H. Forsyth (S.W.)	24	u43

"u" indicates eggs under 2 oz.

SUGAR: FIELD REPORTS.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) received the following report, 18th October, 1923, from Mr. E. H. Osborn, Northern Field Assistant:—

Lower Burdekin.

Rainfall records for current year:—

	Ayr.	Home Hill.	Giru.	Rollingstone.
	In.	In.	In.	In.
January	·32	1·93	2·67	7·42
February	.12	·05	·39	4·91
March	.63	·10	3·34	4·35
April	·55	1·09	·04	1·04
May	Nil	Nil	Nil	2·73
June	3·93	4·12	3·93	6·20
July	·06	·61	·02	·15
August	1·02	·65	1·02	1·78
September	1·38	1·02	Nil	Nil
	8·01	9·57	11·41	28·58

Despite exceptionally dry conditions as indicated in the foregoing table, some really splendid cane was seen throughout the Burdekin; in fact, to see some of this cane in the various mill yards made it difficult to believe that farmers were having such a bad time.

Throughout the Burdekin a large amount of planting has taken place (more especially around Inkerman); but although some very fine early planted cane was seen, a proportion of the later planted cane was affected by cold weather and had only made medium strike. Among extra good blocks noticed was a 32-acre field of H.Q.426 and N.G.24 and N.G. 24B., owned by Mr. R. Oakes. This has had about six ploughings.

Messrs. Cameron and Irving have also a good strike of Badila, planted in July, while some fine B.208 (June) of about 8 acres in area was seen upon Mr. W. Payward's farm. Another fine strike was upon Mr. H. Todd's, comprising Badila, Goru, and B.208, and planted in June. Both Messrs. Payward and Todd ploughed in a crop of cowpea prior to planting, and the ground was and now is in beautiful tilth. Upon the Inkerman side one of the best paddocks seen was planted with Mr. Radcliffe's early crop of H.Q.426. As previously mentioned, there seems to be a larger proportion of young cane upon this side, and, generally speaking, the strike seems to be better. This is probably to be accounted for by the fact that the irrigation scheme is now in full operation, and is being largely availed of by all the growers.

Cane varieties principally planted upon the Burdekin are B.208, H.Q.426 (Clarke's Seedling), the Gorus, Badila, Hybrid No. 1, Q.903, Q.813, Striped Singapore, &c. Many inquiries were made for E.K.28, and the State Farm distributed all that was available.

Some remarkably good cane has been harvested this season. Mr. J. Dwyer states that he cut 280 tons of B.208 (twelve to thirteen months old) for an average density of 18 c.c.s., whilst the H.Q.426, on an adjoining block, cut from 16.40 to 17.80 c.c.s. Messrs. Norris and Thompson, of Maidavale, also cut 7 acres of B.208 plant, yielding 45 tons per acre for a density of 15 to 17 c.c.s., while they expect their whole crop to average 40 tons per acre for the 40 acres harvested. All these areas were kept well watered.

Some very good first ratoons were delivered at Inkerman from Messrs. V. Hansen, S. W. Gibson, and Ferguson. At Kalamia some excellent first ratoons, Goru 24 and 24A, are cutting at the rate of 35 tons per acre from a 6-acre paddock belonging to Messrs. Cameron and Irving. So far its density has averaged 15 c.c.s. No manure was used, but the land is fairly new. The ratoons would be a credit to any cane district in North Queensland.

Manures.—The use of fertilisers is becoming more popular every year upon the Burdekin. Several experienced growers have expressed their intention of using cowpea as a green crop. Where green manuring has been practised the soil shows great improvement, both in its texture and its power of retaining moisture.

Diseases and Pests.—The Burdekin so far has been fairly free from both. Of the former, B.208 and M.1900 were noticed to be suffering from a form of leaf affection, consisting of white spots and blotches withering away at edges and tips of leaves in many places. This is most marked in the former cane, as its side shoots also show the discolouration in places. Evidently dryness makes this more marked this season than in former years. Growers are again strongly advised against planting any but the very best seed.

Grubs as mentioned in my last report, although prevalent to a large extent in one or two farms, have not done as much damage as anticipated.

Pioneer and Inkerman were anticipating an early finish of the crushing. Each mill was enjoying a splendid run, and the quality of the cane was very high.

Haughton Valley (Giru).

This mill was also in full operation, and a good supply of cane of fair density was going through. Like the Burdekin mills, its expected tonnage was much below its earlier estimates owing to weather conditions. The tramway had been completed, and an engine was kept busy pulling cane over its 6 miles of line. Derricks have been erected at central spots, and by its use harvesting has been made much easier.

Despite dry weather and lack of irrigation, some very good young plant cane was noticed on Messrs. Humphrey's, Walton's, McCloskey's, A. and J. Brooks's farms, and the Brandon Estate's 40-acre block. On the lastnamed farm an 8-in. pumping plant has been installed.

Rollingstone—Bambaroo.

Mr. S. Macree has the largest and most forward crop of cane in ine Rollingstone area. He is also now installing an irrigation plant with two pumps.

At Mungabulla and Mutarnee some good cane has been harvested by Messrs. V. Tilvey and Barney.

CLIMATIC CYCLES.

By H. I. JENSEN, D.Sc. (Syd.)

In October last year (1922) the "Queensland Government Mining Journal" paid me the compliment of outlining the solar cycle theory of volcanic and earthquake phenomena and climate which I enunciated in 1902, and published in the "Proceedings of the Royal Society of New South Wales" in 1902 and 1904. The Journal said: "It will be interesting in the circumstances to see if the coming year, 1923, which will be a year of sunspot minimum, will be accompanied, as far as Australia is concerned, with drought conditions and by volcanic eruptions and earthquakes in other parts of the world."

We have seen that 1923 has been exactly what the solar cycle theory prognosticated. In an article in this Journal, May, 1923, I dealt with this same subject mainly in regard to meteorology. As the subject is one of considerable importance, one is justified in enlarging on it, particularly with a view of getting the general public and the Federal Government to realise the necessity of establishing an up-to-date solar observatory in Australia, so that periods of drought and periods of exceptionally wet weather may be forecasted, thus saving the farmers much expense incurred in planting crops doomed to destruction.

If such periods were forecasted wheat could be grown in the coastal regions during the dry cycles, and in the inland regions in wet cycles with immense advantage to the State.

Worldwide periods of drought are of common occurence as shown in my article in May, and occur at sunspot minimum. Thus the years 1811-12, 1834-36, 1855-56, 1866-69, 1876-78, 1888-89, 1899-1902, 1911-12, 1922-23 were years of drought, not only in Australia but in every continent.

Eclipses of the sun are usually accompanied by the most magnificent coronæ in years of sunspot minimum. Such were seen in 1868, 1878, 1889, 1900, 1901, 1912, 1922.

The Rothesay rainfall record, extending over a period of more than 100 years, shows exceptionally dry times to have been experienced in Britain during 1822, 1855, 1887, 1901, and 1922, all years of sunspot minimum.

In Australia we have had severe droughts in 1811-12, 1833-36, 1855-56, 1866-68, 1876-78, 1888-89, 1899-1902, and 1922-23, all periods of sunspot minimum.

On the other hand, the periods of sunspot maxima like 1863-64, 1870-72, 1890-96, 1904-1909, 1914-1919 have been years of average good seasons, though a localised drought was experienced in parts of Queensland in 1916, making a short break in an otherwise good cycle as far as this State is concerned.

Floods like the 1890 and 1893 are often very severe during sunspot maximum periods, especially just after a dry cycle, as there is not much vegetation to delay the run off of flood waters.

The sunspot cycle is not quite regular. A great maximum is followed by two smaller maxima, and a "great minimum" by two smaller minima, before the next great maximum or minimum comes on. We therefore get a 33 to 35 year interval between two periods of exactly similar weather conditions. The very complete researches of Dr. Hann, the Austrian meteorologist, showed that climate as a whole underwent a long period variation of 33-37 years corresponding with three sunspot periods. Other meteorologists like Meldrum, Blanford, Begelow, &c., have shown that this 35-year cycle applies to cyclones in the West Indies, weather conditions in India and other parts of the world.

Since the factors which contribute to this long period variation in solar conditions are astronomical, depending on the attractions of the planets Jupiter, Saturn, and other planets, it follows that to issue true seasonal forecasts the relations between sunspot conditions and planetary attractions must be more closely studied. That is why an Australian solar observatory is so badly needed.

An expense of a few thousand pounds annually in this direction would probably save Australia a quarter of a million sterling per annum.

Without the knowledge that such an observatory would yield it is impossible to anticipate the periods correctly, as the interval between the sunspot maxima may vary from 9 to 12 years, and the Bruckner cycle (the long period variation) from 33 to 37 years.

It is, however, safe to say that the drought we are at present experiencing is a repetition of the one of 1888-89. It commenced in 1922, thirty-four years after the one it is a true parallel of. It will probably finish this year, and in 1924 we will probably get floods like those of 1890, and in 1927 a real severe flood period similar to 1893. Farmers will do well to anticipate a wet year in 1924, especially during the latter half.

The sunspot minimum of 1900-1902 was a great minimum. It will, on the Bruckner cycle, be repeated between 1933 and 1937, with drought in Australia and seismic disturbances in other parts of the world. With a well equipped solar observatory in Australia it should be possible to forecast the commencement and duration of this drought within a limit of accuracy of six months, sufficiently accurate to be of much value to agriculturists.

If ratooning cotton should be permitted by the Government, it would be advisable to ratoon crops during that drought, which will be similar to the one of 1900-1902. As we will probably have ten good years before that drought sets in, there may be many changes in legislation in the interval, and during the good years annual planting may prove most profitable.

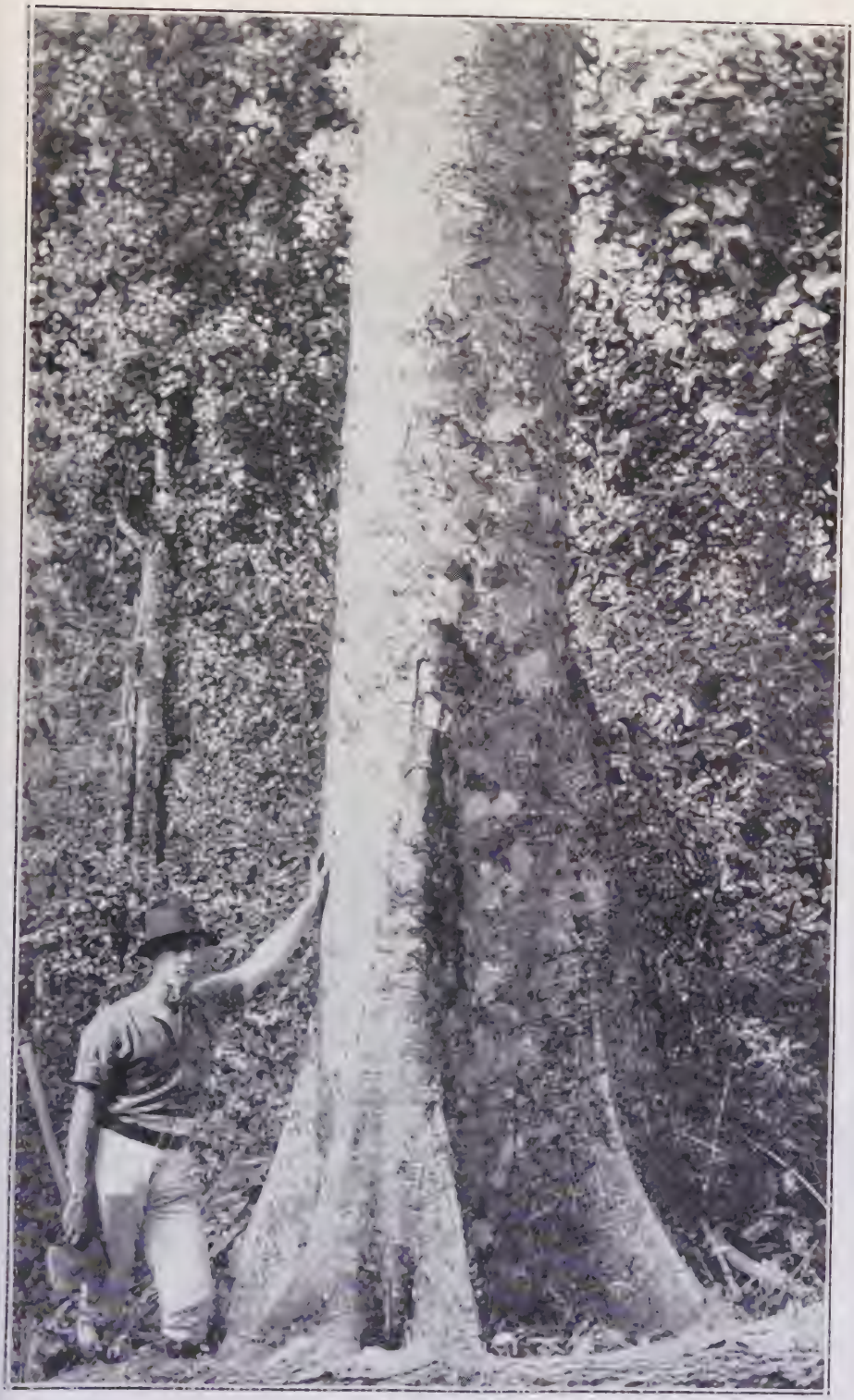
QUEENSLAND TREES.

By C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 25.

PEPPERBERRY TREE.

The Pepperberry Tree, *Cryptocarya obovata*, is a very tall species of the coastal rain-forest or "scrub" country of Northern New South Wales and Queensland. The base of the barrel is frequently flanged or almost buttressed. The bark is grey in colour, and not conspicuously marked by scabs or excrescences. In the field the tree has the appearance of the Bumpy Ash, *Flindersia Schottiana*, but has not the prominent protuberances which appear at intervals along the barrel of the latter species. The timber is pale in colour, and should be useful for indoor fittings and cabinet work. The species is found as far south as the Port Stephens district, in New South Wales (J. H. Maiden), and as far north as Rockingham Bay, Queensland (Bentham).



[Photo. by the Authors.]

PLATE 95.—PEPPERBERRY TREE (*Cryptocarya obovata*).
A Specimen in the Rain Forest east of Emu Vale.

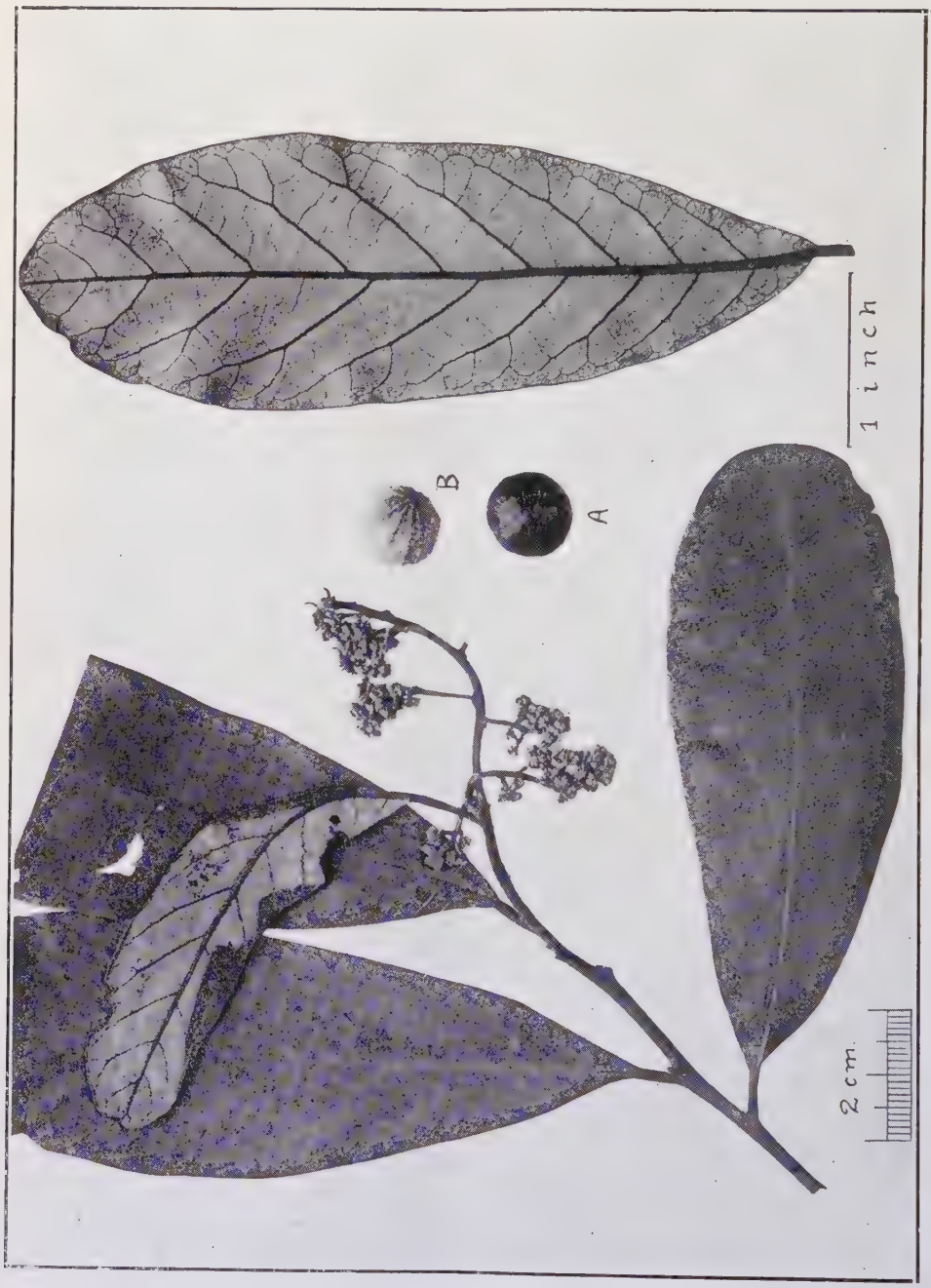


Photo. by Dept. of Agriculture and Stock.]

PLATE 96.—THE PEPPERBERRY TREE.

TOMATO CATERPILLAR OR "WORM"

(Chloridea obsoleta, Say.—*Noctuidae).*

By HENRY TRYON, Government Entomologist and Vegetable Pathologist.

INTRODUCTORY.

Moth caterpillars of one kind or another have been unusually prevalent since the winter months in Southern Queensland, with corresponding injury to plant life. In some instances the moths, their progenitors, have occurred in swarms, extending over large areas.

Amongst the cultivated plants that have suffered is the tomato, ordinarily one of the most profitable ones that are being grown; and the depredator in its case that has committed (and is inflicting still) the most serious injury is the so-called Tomato Fruit Worm—the caterpillar of a noctuid moth—named *Chloridea obsoleta,* that in some instances has rendered useless the entire yield. This insect is of no new occurrence here, being described as a pest insect by the present writer in 1889, when already it was well known. Nor is it exclusively an Australian denizen, for it occurs apparently nearly all the world over, including many of the oceanic islands throughout both the temperate and tropical zones. Moreover, its injurious relations are manifested by a very large number of food-plants, including staple crops, such as maize, cotton, and tobacco. Its dietary here is, too, as general as it is elsewhere. This and its mode of living constitute it an injurious insect of special prime importance, and volumes of literature have been produced relating to it and its control, although notwithstanding—after years of research—the methods devised fall short of meeting the requirements of the situation. One of the most recent compilations was "Injurious Insects of Cotton—The Cotton Worm," issued in February, 1923, by this Office. This very general dietary amongst plants, its very rapid increase, and its habits, especially with regard to feeding, render its subjugation or control exceedingly difficult.

THE INSECT AND ITS HABITS.

Without repeating what is set forth in the pamphlet mentioned, it may be stated that the parent of the caterpillar is a stout-bodied moth measuring about ⅔ inch in length, with a wing-spread of about 1½ inches. When settled, the front wings—usually drab coloured with indistinct brown markings—almost conceal the hind ones, that are whitish with broadly black tips; the former making rather a wide angle with the body and sloping away on each side. These moths are nocturnal in their habits, generally speaking, and occur concealed settled in herbage, or under earth clods during the day, but moving off with dart-like rapidity when disturbed.

The moth feeds on the nectar or honey of different flowers, usually after sundown, but occasionally during daylight, when it may be seen with quivering wings on the blossom it affects.

Each female moth, according to estimates made, may lay from 400 to 3,000 eggs, the average being about 1,000. Moreover, it may commence laying—having meanwhile mated—on the second day of its emergence from the chrysalis, and continue laying for ten to twelve days after this. These eggs are at first whitish in colour and measure about one-fiftieth of an inch across (about half the size of the head of a small pin) and are low dome-shaped, almost spherical, with a series of fine ribs radiating downwards from their tops. They darken as they mature or when parasitised. In the case of the tomato, they are usually placed (always singly) on the green calyx-segments of the flower bud or flower or on the tender tomato growth; but when the insect is numerous, elsewhere.

Our assistants, T. H. Simmonds, B.Sc., and J. Weddell, referring to a marked incident of this nature, recently informed us as follows:—

"Eggs were found on stems, foliage, calyx, petals, stamens. In one case, five eggs were seen clustered on the petals of one flower. The following counts of eggs from one branch, consisting of about six leaves and two flower sprays, were made:—Leaf, 5 eggs on under surface, 6 eggs on upper; flower, 10 eggs on petals and 3 eggs on calyx." Sometimes all the eggs laid will give rise to caterpillars, but as A. A. Girault, Assistant Entomologist, discovered in the course of investigations in the United States in 1905, commonly many do not do so.

The eggs, when deposited, are capable of hatching in as short a period as three days, but usually rather more than four elapse before the tiny pale dark-headed caterpillars emerge. These caterpillars may exceptionally come to maturity amidst the foliage of the tomato plant, but usually speedily repair to the green fruit,

tunnelling their way into it near the calyx end, even when this is partly grown. More frequently, however, as the outcome of the situation in which they are deposited, the minute ovary as it is formed receives their earliest attention. On this subject, Messrs. Simmonds and Weddell again have observed as follows:—

"In several cases the petals had been eaten and young fruit beneath just commencing to 'set' also eaten. Once, on removing the petals and stamens, a very young larva was found inside on the developing fruit."

From the first scene of the insect's depredations, especially in cases such as these, the growing caterpillar passes from one fruit to another, injuring all in turn. Thus a single caterpillar may do considerable damage, since every fruit entered is "done for," so to speak.

The caterpillars each have a larval period of about two weeks on an average, but this may be extended to three. During this time they vary greatly in appearance with each of the six changes of their skins, being unstriped during the first two instars. (Further description is unnecessary in writing for tomato growers.) When full grown it is about $1\frac{4}{5}$ inch long.

When this happens, the caterpillar drops to the ground and digs its way into it, after moving off, if at all, usually but a few inches only. Thus it enters to a depth in it of from $3\frac{1}{2}$ inches to 6 or 7 inches—usually, say, 4 inches. In this position—after first making a special exit tube that nearly reaches the surface again—it forms a little oval cell in which it transforms to a smooth, glossy-brown chrysalis having two straight thorn-like bodies at the tail end. (*Note.*—Should the soil be covered with rubbish, the chrysalis chamber may be nearer the surface.)

This chrysalis or pupal condition varies in duration according to the temperature to which, when in the soil, it is subject. It may be as short as ten and a-half days, but be many days longer if cold be experienced. In a temperate climate where frosts constantly occur during the winter, the insects may live in this condition for eight to nine months. When, however, the full period has been reached, the insect comes forth from its chrysalis.

NATURAL INCREASE AND CONTROL.

The foregoing remarks will suggest that between one egg-laying and another, on the part of the succeeding moth generations, from twenty-eight to thirty-two days may elapse only, and with a congenial climate like that of Southern Queensland it may be readily understood that there may be many generations of moths, and so many distinct broods of caterpillars during such a long season as is devoted to tomato-growing is the latitude of Brisbane. These broods, however, are not distinctly defined, as all the moths of one age do not emerge on a single day and oviposition in the case of any one individual extends also over several (*vide* "Successive Generations," "Injurious Insects of Cotton," p. 6).

The theoretical potential increase, however, is perhaps never realised, as natural conditions supervene to obviate this. These are weather conditions, food conditions, and natural enemies—birds, insects, and diseases. On the other hand, as has recently happened, these natural agencies for controlling numerical development and crop injury have evidently been restrained in their activity, and hence the loss of crop.

There is, however, in the presence of parasites of the Tomato Caterpillar that have come upon the scene, some prospect of natural enemies operating to restore normal conditions, notwithstanding the immense toll on insectivorous bird life arising from extensive bush fires operating during the breeding seasons, when all birds are animal (insect) feeders—fires often wantonly started. These parasites that have been observed by the staff are a minute egg-parasite (Trichogramma), a caterpillar fly parasite Tachinus, and an Ichneumon parasite; but as yet the extent to which they are operative has not been ascertained. Again, disease that is present with the occurrence of wet weather might prove especially virulent towards the insect.

MEASURES OF CONTROL.

Field Practice.

Avoid growing in the vicinity of crops of tomatoes plants that in common with it afford sustenance for the insect, unless they, too, receive continuous attention directed towards its repression. This especially applies to maize, cotton, cape gooseberry (*Physalis*), rosella, and tobacco, but also to plants that receive less attention by the Chloridea than they; thus peas must not be overlooked, and so also certain ornamental plants such as snapdragon or Antirrhinum.

Wormy tomatoes (beings already rendered useless) should be gathered and destroyed; burying to a depth of 1 foot will in most cases meet the latter requirement. This will prevent sound fruit being visited by caterpillars from injured fruit; but it will also destroy those "worms" that, otherwise, would leave it, to enter the soil to give rise in a few days to moths whose progeny would intensify the trouble. Tomato plants when eradicated should also be burnt, as soon as practicable, rather than left in heaps on the headlands.

Prior to planting, and especially when contrary to what is above suggested, devoting the same area to immediate successive tomato growth, and in which case as long an interval as may be found convenient should be observed, the soil should be well cultivated and turned over more than once. Thus will be exposed to the fatal action of birds and the weather those insects dwelling in it, either as chrysalises or caterpillars about to change within their earthen cells. So also when the tomatoes are being grown the soil should be cultivated wherever it is admissible to do so. Should again a "green crop" such as cowpea or Mauritius bean, that may harbour also the insect be ploughed under prior to planting, this should be well covered under and pressed down by rolling, so that any caterpillars present be destroyed.

As far as economic considerations will admit of it, crops that are not attacked by this insect should be grown in alternation with those that are—*e.g.*, cucumbers or rock melons as a substitute for tomatoes.

Trap Crops.

Observation indicates that although the insect reared as a moth from one kind of plant has often acquired a liking for it again, generally speaking, there are those that it especially favours. This especially applies to maize as compared with tomato, particularly to the cooking variety known as sweet corn. Maize is therefore commonly grown in other countries as a trap crop in protecting cotton from its injurious presence. It is especially serviceable in dealing with the first brood of insects. Its value as a trap entirely depends, however, on its being taken out and used as or converted into fodder, as soon as or shortly after the silking stage has been reached. Otherwise it will serve, whilst attracting the moths from all round it, to furnish in due course others to attack the plant it is intended to protect. Obviously it is not implied that maize can be grown as a substitute for the tomato as a crop of equal monetary value, but when no yield of tomatoes is promised owing to caterpillar attack its growth may be profitable. Under special circumstances the use of a special "green manure" plant, Canavallia striata, whose pods are favoured by Chloridea, has been adopted with some success as a trap crop.

Trapping and Repellants.

With regard to methods of destruction directed against the moth itself, the very extended experience of entomologists in other countries, as well as in Australia, does not afford much promise of success. It is not at all or very seldom attracted by light, and therefore special trap lamps, torches, or fires are not available for its capture and destruction. Again, the same remark applies to baits, with or without poison incorporated in them, so useful in coping with the final forms (moths) of other destructive caterpillars. Nor do we know of any substance that will with certainty repel attack on plants threatened. Our Queensland experiences suggest that Bordeaux mixture, when well applied, has some efficacy as a deterrent, but the caterpillar being an internal feeder, except when in the earliest stages of its life, any deterrent has only a transient use.

Contact Insecticides.

This also applies to the use of contact insecticides, on whose efficacy success in coping with other plant injurious insects is so noteworthy. Here, however, we are further confronted with a plant very liable to injury by these potent applications, with too abundant foliage to be affected by them. Our assistants, Messrs. J. H. Simmonds, B.Sc., and J. Weddell, have, however, pointed out that the "worm" is often partly exposed when tunnelling in the fruit and thus not only so when recently emerged from the egg, and so then may also be reached by a direct application, and the writer proposes to test the action of Derrine (that is not plant injurious) under these circumstances.

Food Insecticides.

The use of arsenic-containing insecticide, and the same applies to those containing antimony or cadmium, is not always attended with profitable results. In fact, under field experimental conditions elsewhere, more wormy fruit has been noticed on tomatoes after the application of arsenate of lead (or Paris Green) than on control

plants that have not received any. The better results from the use of these bodies will, however, be reached by closely noticing when the prevalence on the plants of the moth's eggs occur, and then spraying about a week subsequent to this event, a small hand magnifier being useful for the preliminary observation. The application of these insecticides in the form of powder diluted with corn meal, ground sulphur, lime, ashes, &c., is favoured elsewhere, but success in this case is conditioned largely by the state of the atmosphere, since when the air is dry the insecticidal powder is liable to be soon blown away. For the same reason it must be applied very early in the day when dew is still upon the plants or when light rain is being experienced.

Insecticide and Fungicide.

As a routine treatment of tomato, as well as of potato plants, this Office has persistently advised the application of Bordeaux mixture, of 4-40-4 strength (freshly slaked lime 4 lb., bluestone 4 lb., water 40 gallons) made quite neutral, and which is especially adherent if a little soap solution, or preferably molasses, be incorporated with it. This treatment is recommended as a preventive of blight and of less harmful leaf disease, the former of which at times is quite fatal to the tomato. Arsenate of lead may be combined with this fungicide, and 1 lb. to 24 gallons (six kerosene tinfuls) is the amount of it that should be added. As, however, with its use as a fungicide only several applications are necessary. This, however, should have some reference to the general hatching of the eggs of each moth brood, rather than to the lapse of so many days. Spraying also should be commenced very early so as to catch the first brood, as it is very necessary to concentrate on this. In Sumatra the same insect is very harmful to the tobacco, and there the plants are sprayed whilst still in the seed bed.

The Bordeaux mixture slightly reduces the potency of the poison, but then it promotes its adhesiveness to the plant as well as exerts some deterrent action in warding off attack.

NATURAL ENEMIES.

Sedulously preserve native insectivorous birds. Even many of those proclaimed "pests," if permitted to operate over the soil of a tomato field undergoing cultivation would rid it of the insects then occurring thereon.

A study of the parasites of *Chloridea obsoleta*, as recorded in the world's entomological literature, does not leave much hope of any efficacious work in reducing the insect, through the introductions of ones not already occurring here. Borneo is the only country apparently in which this method has been essayed, and its effort has been concerned with an egg-parasite that as it seems already occurs here.

The very slight extent, if at all, to which *Chloridea obsoleta* occurs to an injurious extent in Egypt in relation to the different plants it is associated with there seems to receive its explanation not in the work of parasites but in the cultural treatment that the soil there persistently receives. So also to a less degree with respect to British India.—H.T., 25th October, 1923.

SUGAR AS A FOOD.

Sugar is not detrimental to the teeth, says Sir James Crighton-Browne, the well-known physician, who, in an address before a recent grocers' convention in England, not only made the statement in defence of sugar, but also carried the war into the enemy's country with the further assertion that perhaps sugar more than any other article of food tends to promote the flow of saliva in the mouth, "than which nothing could be more conducive to the preservation of the teeth in a clean state." Sugar is also an aid to digestion, Sir James pointed out, promoting the flow of gastric juice.

The Australians were the finest physically of all the people engaged in the world war, according to Sir James, who voiced his conviction that there is a direct relation between the physical development of a race and the amount of sugar it consumes. The Australians, he showed, consume more sugar per capita than any other people in the world. He also called attention to the Danes, who, also of excellent physique, are heavy sugar eaters, as are likewise the people of the United States and the United Kingdom. Certain nations of Southern Europe, which consume relatively little sugar and who are less notable for physical development, were cited by Sir James in support of his theory.—"South African Sugar Journal."

FRUIT FLY INVESTIGATION.

The Minister for Agriculture and Stock (Hon. W. N. Gillies) has made available the following report of the Entomologist at Stanthorpe (Mr. Hubert Jarvis) for August and September, 1923:—

FRUIT FLY.

No fruit flies have hatched in the Insectary or in the field experiments during the months of August and September. Three fruit flies were reported to have hatched from a last season's quince, which had been kept in a jar indoors at the Summit all the winter; these flies were, however, destroyed and did not come into my possession. On 23rd September, Inspector J. Henderson submitted to me three fruit flies for identification. These flies, he stated, were bred from maggots found in one of some bananas received on 19th June at Stanthorpe from Yandina, N.C. Mr. Henderson, who, on finding the maggots in the fruit, at once placed them in a glass jar with some soil, added that the three fruit flies hatched about 13th September. The weather conditions at that date were exceptionally mild and warm for the time of year. The flies all proved to be examples of *C. tryoni* (the Queensland fruit fly)—two males and one female. This occurring once also in bananas is, moreover, of very great importance, in view of the fact that the banana is not included in the list of fruits requiring cool storage prior to their importation into the Granite Belt.

One other instance of maggots found in imported custard apples during the last few weeks was communicated. These maggots were, however, not forwarded to me, since on being discovered in the fruit they were at once destroyed. The foregoing incidents, however, point to the fact of fruit fly introduction to this district by fruit imported from the markets, and also by fruit sent or brought into the district by private individuals; and too much care cannot possibly be exercised—particularly at the present time of year—to guard against the introduction of the Queensland fruit fly by such means as these.

All persons finding maggots in purchased or donated fruit should at once destroy it by fire, or place it in a secure tin container and then forward it to the Entomologist for identification and other purposes.

OTHER INJURIOUS INSECTS.

Codlin Moth (*Carpocapsa pomonella*).

The larvæ of this apple moth, which were obtained last autumn and during the winter, are now assuming the chrysalis form. Isolated Codlin Moth hatchings have occurred in the field, as is evidenced by several fresh empty pupa-cases which have been met with in the orchards. No moths have, however, yet emerged from the material under observation in the Insectary, but numerous hatchings may be expected within the next few days; one or two varieties of apple are now (2nd October, 1923) in full bloom.

(*Note.*—The time of commencement of spraying should be determined by the appearance of the earliest moths in relation to that of blossoming. When the moth first appears, they will usually on the fourth day from this be laying eggs and continue doing so seven days (average). These will hatch on an average in seven and a-half days. Spraying, therefore, must be started within twelve days of this event. But the full effectiveness of this, the first spray, will also depend on the apple blossoms having just dropped their petals, and whilst as yet the calyx-lobes have not turned in to close the outer calyx, cups in which the young "worms," if present, feed. Other considerations point to the necessity of a second spray when ten days from the first spray have just elapsed.—H. Tryon, Entomologist in Chief.)

Apple Weevil *(Doticus pestilans).*

Several instances of the occurrence of this little beetle (in the larval condition) in dried and mummified apples have been brought to my notice during the last few weeks. On breaking open a dried apple or quince the grubs or larvæ of this insect may be often met with, and they have (presumably owing to their situation) even been mistaken for fruit fly grubs.

The beetle, which is about 3/16 inch long, lays its eggs in drying or dried fruit, and the young grubs on hatching feed in this until about August, when they turn to pupæ in the tunnels mined by the larvæ; the beetle emerges in early spring. Some under observation hatched on 8th September, 1923. This beetle never attacks sound and healthy fruit, and therefore is not considered to be a fruit pest.

USEFUL INSECTS.

"Hover Flies" *(Syrphidae).*

Several species of these useful flies, belonging to the order Diptera, are now on the wing and waging war on the various destructive aphides—"plant lice." *Syrphus pusilla* is busy among the black peach aphis, and its active larvæ or maggots may be watched devouring numbers of this destructive pest. The Hover Fly larvæ may easily be recognised by their elongated shape, roughened coloured surface, and active movements. When full-grown they attain a length of about ½ an inch, being thick at the anal extremity and tapering to a point towards the head. This they have a habit of lifting and moving rapidly in all directions; they are generally white or greyish white and coloured. The adult insects are broad, flat-looking flies, about ½ an inch in length, and are furnished with strong wings. Their general colour is bronze-black marked and striped with yellow. The common name of "Hover Fly" is very descriptive, as these flies have a habit of remaining almost stationary in mid-air, with rapidly vibrating wings, close to a blossom or to the aphis colonies. When disturbed they will dart rapidly to a new situation and again hover in the air. I have dealt somewhat at length with this insect and its habits, as it is important that the orchardist should learn to recognise these flies as useful insects and among his best friends.

Woolly Aphis Parasite *(Aphelinus mali).*

On 14th August, 1923, the promised consignment of parasitised woolly aphis (*vide* report, June-July) arrived as a gift to us from Dr. R. J. Tillyard, M.A., of the Cawthorn Institute, New Zealand. The material sent was at once taken to the Insectary and placed in the special breeding-box or cage designed by Dr. Tillyard for the purpose of dealing with the insect on being received. At once also one or two aphides were taken from the consignment for examination, and as a living pupa of *Aphelinus mali* was found within the body of one aphis, hope was entertained of obtaining some of the parasites in spite of delay in transit. The weather was cold with almost nightly frosts until about 23rd August, when warmer weather conditions were experienced. Pending the hatching of the parasites, three apple trees harbouring Woolly Aphis had been chosen (and suitably protected from weather, &c.) to act as a nursery for the parasite on its hatching. The situation of these trees is as follows:—One at A. H. Paget's, The Summit; one at H. Lee's, Applethorpe; and one in the orchard of Mr. T. J. Ballanger, Stanthorpe.

Dates of hatching of parasites are as follows:—

Date of Hatching.	Number Hatched.	Male.	Female.
August 29	16	9	7
,, 31	3	1	2
September 4	8	3	5
,, 7	4	2	2
,, 8	4	3	1
,, 10	4	2	2
,, 14	8	3	5
,, 15	4	..	..
,, 18	8	2	6
,, 20	4	1	3
,, 22	2	..	2
,, 24	28	10	18
,, 25	11	..	..
,, 28	3	1	2

Total hatchings to date, 107; approximate number of males, 37; approximate number of females, 55.

With the exception of six preserved for reference and four that perished owing to a damp tube, all the above parasites were liberated on the three aforementioned trees. Of the number, thirty-eight were liberated at The Summit and the remainder at Applethorpe and Stanthorpe. In some instances a gauze sleeve was first placed around a Wooly Aphis infested branch, and the parasites were liberated within this sleeve as an additional precaution against failure in their establishment. Some difficulty was experienced in getting the parasites to walk on to the tree, for they seemed disinclined to leave the tubes. When alarmed or touched they have a habit of jumping, and great care was necessary to prevent this happening; but the

loss of one or two in this manner was unavoidable. I found the most successful way to secure their attachment was to remove the cotton plug from the tube and tap the end of the tube down smartly on to a flat portion of a branch. The parasites would then be precipitated down on to this branch, and after a second or two, the tube being lifted, the parasites would disperse along it. Many were seen to crawl among the Woolly Aphis colonies with evident interest. To accelerate issue from the pupæ of the parasites I found it advisable to keep the air moist in the breeding cage; a fairly large piece of cotton-wool soaked in water and placed in a tin inside the breeding cage will accomplish this. One experiment has been made to test if it be practicable to induce *Aphelinus mali* to attack the Black Aphis of the peach. Thus a branch of the infested peach with individuals of this aphis was netted in with gauze and six Aphelinus liberated among them.*

Dr. Tillyard has stated that Aphelinus will attack any of the dark-coloured aphides, and in respect to the Black Peach Aphis it may therefore be the case.

When once established here, an effort should be made to introduce *Aphelinus mali* to other parts of the State, as it may prove a valuable help in controlling the Orange Aphis and also the aphis of the banana, both of which are dark-coloured insects.

The care and liberation of this parasite—*Aphelinus mali* (with occasional necessary visits of inspection, &c., to orchards)—has occupied my time during the whole of the month of September.—H.J., 2nd October, 1923.

* The economic importance attaching to the first introduction to Queensland of a parasite of the Woolly Aphis of the apple justifies this extended notice of procedures taken following this event, so that if the establishment of *Aphelinus mali* be effected, an efficient method may be known for the guidance of others, and if not, an opportunity be available for ascertaining any modification in them needful.—H.T.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS FOR SEPTEMRER, 1923.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			Lb.	%	Lb.	
College Grandeur	Jersey ..	11 July, 1923	480	6·0	33·90	
Hedges Madge ..	Friesian	18 Aug., 1923	840	3·3	32·40	
Prim	„ ..	4 April, 1923	930	2·9	31·20	
Miss Security ..	Ayrshire	8 June, 1923	690	3·9	31·20	
Magnet's Leda ..	Jersey ..	18 Aug., 1923	630	4·0	29·42	
Bellona	Ayrshire	3 Aug., 1923	630	3·6	26·40	
Lady Meg ..	„ ..	14 July, 1923	570	3·8	25·50	
College Cold Iron	Jersey ..	23 April, 1923	450	4·8	25·20	
Songstress ..	Ayrshire	22 Aug., 1923	540	3·8	24·	
College Evening Glow	Jersey ..	5 April, 1923	420	4·8	23·70	
College Prima Donna	Friesian	19 Mar., 1923	600	3·4	23·70	
Rainfall of Marinya	Ayrshire	29 Mar., 1923	510	3·8	22·80	
Comedienne ..	Jersey ..	10 July, 1923	450	4·3	22·50	
College Desire ..	Ayrshire	11 July, 1923	450	4·3	22·50	
Soprano ..	„ ..	14 June, 1923	420	4·5	22·20	
College Damsel..	Friesian	27 April, 1923	480	3·9	21·90	
Lute	Ayrshire	26 April, 1923	480	3·8	21·30	
Lady Loch II. ..	„ ..	26 April, 1923	510	3·6	21·30	
College St. Martha	Jersey ..	25 June, 1923	360	5·0	21·	
Buttercup ..	Shorthorn	7 Sept., 1923	672	2·5	20·64	
Snowflake ..	„ ..	17 May, 1923	510	3·4	20·10	
College Ma Petite	Jersey ..	12 June, 1923	420	4·1	20·10	
Gay Lassie ..	Ayrshire	11 July, 1923	420	4·1	20·10	

ABSTRACTS AND REVIEWS.

Mangolds in Combination with Maize.

Succi, A., in "L'Italia agricola," Year 50, No. 8, pp. 265-268. Piacenza, August, 1922.

The writer calls attention to the economic advantage of growing mangolds mixed with maize, a combination which he has tried with success for about twenty years. The mangolds are sown between the lines of maize and at the same time or a little earlier. The two plants spring up and grow together; the maize then develops rapidly and the growth of the mangolds gradually slows down until it stops completely; by degrees as the maize begins to ripen the pressure is eased and the mangolds again begin to grow and after the maize is harvested, develop quite normally.

At this time, the beginning of autumn, the soil is the seat of a powerful chemico-biological activity by which the mangolds are able to profit; they leave therefore to the next crop, which is generally wheat, smaller quantities of fertilising principles and especially of nitrogen; it is therefore necessary to make up the deficiency by abundant manuring of the maize when combined with mangolds or by applying a quick acting fertiliser to the wheat.

That there is no danger of the mangolds dying during the suspension of growth has been ascertained by the writer even in the case of its combination with Caragua giant maize, as well as in southern districts with dry summers and in light mellow volcanic soils.

The combination allows for compensation for the damage which in some years drought causes to the maize, for the reduced growth of the maize allows the mangolds to grow larger.

Lastly, the writer gives the appropriate cultural rules:—The soil to be sown should be crumbled; the space between the lines of maize should not exceed or but slightly that of maize grown by itself—*e.g.*, for early *Reggio* dwarf maize, it should measure 16 to 20 inches; no special attention is necessary for the associated crops; weeding and earthing up are done at the same time; the uprooting and transplanting of the mangolds causes no injury to the maize.

Sugar beet is much less suitable for growing with maize; whatever variety is grown the roots can only be used for feeding cattle; it is therefore better to grow mangolds in combination with maize, as they give a more abundant crop.

The Sowing of Seeds and Scattering of Chemical Fertilisers Simultaneously in Parallel and Close Lines.

Bandry, A., in "Comptes Rendus des seances de l'Academie d'agriculture de France," Vol. 8, No. 20, pp. 574-580.

Low crop yield is due less to the insufficiency of chemical fertilisers used than to their imperfect utilisation by the crops. It was decided to place within immediate reach of the young plants the mineral nutriment needed by them from the earliest stages of their growth. For fifteen consecutive years the author studied the application to extensive cultures of the simultaneous scattering of chemical fertiliser and seed grain in close parallel lines. The results obtained are as follows:—

(1) The maximum profit in practice from crops, both of cereals and pulse, has always been obtained by using quantities of chemical fertilisers varying from 270 to 360 lb. per acre.

(2) With more than 360 lb. of chemical fertiliser the value of the increase in weight of the crops did not correspond with that of the increase in weight of the chemical fertilisers used.

(3) The yield per acre of useful dry matter from the crops obtained by using 180 to 360 lb. of chemical fertilisers spread in lines has been at least equal and often superior to that obtained on the same soil by using 540 to 900 lb. of the same fertilisers distributed in the usual way.

(4) Chemical fertilisers sown in lines at a depth of 1 to 1¼ inches in close proximity to the seed have a beneficial effect on the young plants.

The author concludes that this method of rational utilisation of chemical fertilisers is so effective that it has become possible to reduce the quantities hitherto judged necessary to ensure the maximum practical profit from crops by 50 to 60 per cent.

Influence of Irrigation on the Composition of the Soil.

GREAVES, J. E., in "Journal of the American Society of Agronomy," Vol. 14, No. 5, pp. 207-212, bibliography of seven works.

Water has a double action on the soil. It assists or hinders the normal development of the processes in the soil, and its most manifest influence is over the process of nitrification, of which the maximum is attained when the soil contains 60 per cent. of its water-holding capacity. Above or below this concentration there is a decrease; and nitrification ceases when the quantity of water reaches or exceeds 90 per cent. As regards nitrification, therefore, an excess of water is more detrimental than an insufficiency. Under good moisture conditions, from 50 to 100 lb. of nitric acid may be produced in an acre of soil during a season; it is a well-known fact that this acid is of great assistance in the liberation of phosphorus and potassium. The moisture content acts similarly, but in a less degree, on ammonification, the maximum production of which is also reached when the soil contains 60 per cent. of its total water-holding capacity. All the other processes which take place in the soil are also dependent on its water content; for instance, the production of carbonic acid gas; it also plays an important part in the solution of tricalcium phosphate. Finally, it influences the production of lactic, acetic, butyric, sulphuric, and other acids, which help to dissolve potassium, &c.

The other fundamental action of irrigation water is that it brings or carries away plant food; it impoverishes or enriches the soil. To gain an idea of the enormous quantity of substances that water may carry off from the soil, it is only necessary to consider the constituents of river water. The substances in solution such as, for instance, sodium chloride, are not generally of any importance in agriculture, but useful substances, such as potassium, nitrogen, and phosphorus, are not lacking. The writer describes certain analyses on this question. Some irrigation drain waters are still richer; certain of them contain as much as 133 lb. per acre-foot.

When irrigation is carried out properly, the water, as it evaporates, deposits the substances it contains, as in the case of the Nile. Thus, in Utah, the waters used for irrigation contain 0.79 to 59.0 parts of potassium per million, or an average of 5 parts which may be used by the soil. Irrigation waters contain, besides potassium, nitrogen and other useful soluble substances; they are therefore capable of improving the soil. The great point is to irrigate *in moderation* in order not to *wash out* the soil. Irrigation may transform the desert into a garden or render the most productive fields barren, according as it is well or ill done.

The Radio-Telephone as a Means of Distributing Weather Forecasts, Crop Reports, and General Agricultural News.

I. "Journal of the Ministry of Agriculture," London, August, 1922, p. 444.
II. " The Dakota Farmer," 1st March, 1923, p. 231.

In England, in France, and in the United States the wireless telephone has already, to a more or less extent, been brought to the assistance of agriculture. The feasibility of using wireless telephoning in this connection has been amply proven, and the results have been satisfactory.

The British Air Ministry issues daily by means of radio broadcasting a number of weather reports of considerable use to the farmers, and a pamphlet giving particulars concerning these messages has been distributed. Special forecasts are also issued during the harvest season.

The National Meteorological Office of France broadcasts weather bulletins from the station on the Eiffel tower twice daily. Every commune is to have a receiving station in the parish school, police station, or at the home of some chosen person, where the messages will be received and posted. The messages are communicated in the district by the ringing of a bell—no ringing if there is no change of weather, three strokes to announce rain, six to announce frost, ten to announce storms or hail. In England, where the farm houses are more isolated than in France, it is proposed that the messages be received at suitably chosen towns, and redistributed from them to villages and to farms in possession of the cheap wireless receivers already at the disposal of the general community.

The United States Department of Agriculture has organised and developed a comprehensive radio programme that covers the entire country. This service includes market reports, weather information, and general agricultural news. At the present time the radio crop and market news service of the Bureau of Agricultural Economics is handled by four high-powered radio-telegraph stations of the Navy Department,

five strong radio-telegraph and one radio-telephone station of the Post Office Department, and seventy-eight radio-telephone stations belonging to colleges, State Agricultural Departments, electrical companies, newspapers, stockyards, and other interested concerns.

In July, 1922, there were ninety-eight stations in thirty-five States broadcasting daily weather forecasts and warnings by radio-telephone. Weekly reports on the effect of weather on crops and highways, and other information issued by the Weather Bureau are also disseminated by the station.

An international weather information service and crop reporting service is also being built up. A daily radiogram is sent to the French Meteorological Service and broadcast from the Eiffel tower all over Europe. The Weather Bureau receives radio reports from European countries in exchange. Crop reports are exchanged with the International Institute of Agriculture at Rome and with the Egyptian Government.

Another service consists of a number of short speeches on various agricultural topics which are broadcast from the Naval Radio Station at Arlington, Va. Educational talks on all subjects pertaining to farming are broadcast by private stations.

The United States Department of Agriculture does not operate any wireless equipment, but the radio distribution work is carried on through stations operated by other Government Departments, by corporations, and by private individuals.

The prices being paid for cash grain as well as for grain for future delivery in the Exchange Room of the Chamber of Commerce of Minneapolis, are now being broadcast throughout the north-west of the United States by radio. The following quotation from "The Co-operative Manager and Farmer," February, 1923, shows how this is done:—

"The Minneapolis Chamber of Commerce quotations are being broadcast through the courtesy of the North-Western National Bank, one of the subscribers above mentioned. The time schedule of these quotations is as follows:—At 9.40 a.m. the "opening" prices of grain and flax for "future delivery." At 10.30 and at 11.30 a.m. the "going" prices of grain and flax for "future delivery." At 1.30 p.m. the "official closing prices" of cash grain and flax, also grain and flax for "future delivery." This schedule applies to every business day, including Saturday.

"A Western Union 'ticker' or type recording telegraph instrument has been placed in the transmitting room of the Oak Grove station by the Chamber of Commerce Quotations Committee. This instrument is connected directly with the so-called piano grain ticker transmitter located in the Exchange Room of the Chamber of Commerce of Minneapolis. The operator of this piano grain ticker transmitter delivers to the Oak Grove station the grain prices above mentioned, and these prices appear in type upon the 'tape' which is constantly issuing from the ticker in the Oak Grove station. The operator at the Oak Grove station immediately broadcasts these prices over the north-west by radiophone."

The Chicago Board of Trade also broadcasts market and crop news from a powerful sending station. In fact, all the facilities of the vast crop-reporting system of the Board are now placed at the disposal of the farmer free of charge. And these facilities are one of the marvels of modern commerce.

Electric Windmills.

PETTRE, F. Des Aeros electriques. "Journal d'Agriculture pratique," Vol. 35, No. 38, pp. 258-9, Paris, 1922.

Windmills when fitted with suitable transmission can be made to drive a compound dynamo of special construction, so as to produce a nearly constant voltage with different speeds of rotation, and thus provide light for all the buildings on a farm. With windmills made to produce an electric current, the velocity of the wind must be at least 2.50 miles per second, as otherwise the dynamos do not furnish sufficient voltage. Therefore, storage batteries of fairly large capacity are necessary in order to store up the reserve energy produced by strong winds, and thus provide the force required for lighting. An automatic relay allows of the storage batteries being charged under different tensions.

The Oil-Bearing Sunflower on the "Riviera di Ponente," Italy.

PERSICO, W., in "Costa azzurra Floreale-Agricola"; reprinted in "Bolletino dell' Associazione italiana pro Fiante medicinali, aromatiche ed altre utili," Year IV., No. 10, pp. 155-156.

The author recommends that the large, one-flowered, so-called Russian variety of *Helianthus annuus* should be grown as oleiferous plant in the Riviera di Ponente, as

its product is quite equal to olive oil. Very satisfactory trials have been made in the experiment vineyards and rose gardens of Pietralunga, where it has been found that about twenty quintals of seed per hectare may be expected. The seeds give 15 per cent. of oil and 80 per cent. of sunflower-seed cake, or 3 quintals of oil and 16 quintals of cake per hectare. Without irrigation, some plants, 46 cm. in height and with heads 46 cm. in diameter, were obtained.

The seeds of the sunflower are not only used for cakes, and in a variety of other well-known ways, but also supply an excellent flour for cake-making, while the stalks furnish a silk-like fibre and an ash with a high potash content. A brilliant yellow dye is obtained from the petals, and the leaves are used instead of those of *Datura Stramonium* as a remedy for asthma.

Beef Production.

"Live Stock Journal," United Kingdom, 10th August, 1923.

The first thing that should be looked to in a beef animal is the general form—low, broad, deep, smooth and even, with parallel lines. No wedge shape is wanted for the block. Next in importance is a thick, even covering of the right kind of meat in the parts that give the high-priced cuts. This is a very important factor in beef cattle that is often overlooked. By the wholesale method of cutting beef about 28 per cent. of a good carcase of beef sells for nearly 64 per cent. of the total value. The high-priced cuts are the ribs and loins These parts on an average sell for about three times as much per lb. as the others. Good, broad, well-covered backs and ribs are absolutely necessary to a good carcase of beef, and no other excellences, however great, will compensate for the lack of this essential.

It is necessary to both breed and feed for thickness in these parts. And mere thickness and substance here are not all. Animals that are soft and patchy, or hard and rolled on the back, are sure to give defective and objectionable carcases, even though they are thick; and they also cut up with correspondingly greater waste. The men who buy cattle and fix their market value are shrewd enough to know almost at a glance how much and just what kind of meat a steer, or carload of steers, will cut out, and if the producer overlooks any of the essential points he is compelled to bear the loss.

Then, in addition to securing the general beef form and make-up, together with good backs, ribs, and loins, there is a certain quality, character, style, and finish that constitute an important factor in determining the value of beef cattle. One of the first indications of this is to be found in the skin and coat. A good feeding animal should have a soft, mellow touch, and a fine but thick and heavy coat. A harsh, unyielding skin is an indication of a sluggish circulation and low digestive powers. The character and finish exemplified by a clear, prominent, yet placid eye, clean-cut features, fine horn, and clean, firm bone, all go to indicate good feeding quality and a capacity to take on a finish of the highest excellence, and consequently to command top prices. Do not tolerate too large or too coarse bone. Coarse-boned, rough animals are almost invariably slow feeders and hard to finish properly. A certain amount of size is necessary, but it should be obtained without coarseness. The present demand exacts quality and finish rather than size. Besides these qualities, and above all, it is necessary to have vigour and constitution. We find evidence of these in a wide forehead, a prominent brisket, broad chest, full heart girth and general robust appearance, and without them other excellence will not have its highest significance.

Attention is called, by way of emphasis, to the necessity of having the right kind of cattle to insure a profit, or rather to avoid a loss. There is not a very great difference in the rate of gain, or the number of pounds of increase in a weight from a given quantity of feed, that will be made by a representative of the best beef breeds and a genuine scrub. This is a fact that practical breeders and improvers of live stock were slow to accept at first. In fact, they did not accept it until it was repeatedly demonstrated. After all, there is no well-founded reason why a Shorthorn or a Hereford or an Angus should make more gain in weight from a bushel of corn than a scrub. This is governed altogether by the digestive and assimilative machinery of the steer. The despised scrub usually has a digestive system like a goat, and is always hungry. Scientists have discovered that civilised man has no greater powers of digestion than the barbarian or the Indian. Neither has the improved steer better digestion than the native. The feeder is often deceived in the belief that he has a good bunch of cattle simply because they feed well and gain rapidly. Economy of production is an important factor, but it is by no means all. It is even more important to have a finished product that the market wants and will pay for than that it simply be produced cheaply.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations has received the following report (23rd October, 1923) from the Entomologist at Meringa, Mr. Edmund Jarvis:—

PARA-DICHLOR. EXPERIMENTS AT MERINGA.

Summary.

The experiment plots at Meringa consisted of a strip of land 605 feet long, embracing eight rows of first ratoons of D.1135 and ten untreated rows. Injections of para-dichlor. were put in on 25th January with the "Jarvis Injector" (designed for injecting dry materials) on both sides of cane rows, from 12 to 18 inches apart, 6 inches deep, and 4 inches from stools. Owing to the land having been cultivated to an average depth of 6 inches the crystals of para-dichlor. were in many cases embedded in unbroken soil.

A fortnight later the odour of the fumigant was noticeable 2 inches below injections, and had penetrated upwards to the surface, impregnating a strip of land about 20 inches wide situated directly under the lines of stools. This fumigation of the soil had been accomplished by an evaporation of only one twenty-fourth of an ounce of para-dichlor. (one-sixth of the ¼-oz. injection) still leaving sufficient in the soil (five scruples) to maintain such fumigation for ten weeks longer. Three months after application the cane was 7 to 8 feet high, and upon looking down from a height of about 12 feet one could at once notice the green edges of treated areas sharply bounded by the yellowing borders of the grub-infested check plots.

At this time not a single yellow patch could be seen in the treated area, the cane in which continued of an uniform dark healthy green. When examined three weeks later (17th May) this contrast between green and yellowing grub-smitten cane had become very marked indeed, and upon counting the stools in six treated and the same number of check rows it was found that out of 1,800 treated stools sixty-nine appeared to be grub-affected; while in the six untreated rows 1,354 out of 1,800 stools were decidedly grub-smitten.

The sickly stools occurring in treated rows were surrounded by or growing alongside green healthy stools, thus indicating that such occurrence was in many cases not due to failure of the fumigant, but to defective treatment, or to non-application, owing to certain stools having been accidentally missed. This was very clearly exemplified by a row of 300 stools injected by the one man, which presented an unbroken line of green foliage without a single grubby stool, showing that this row had been carefully and uniformly injected throughout the entire length. Running parallel to it and only 4 feet 6 inches away, the edge of an adjoining check plot formed an almost continuous row of stunted grub-eaten cane. The unmistakable contrast between these two rows was amply sufficient in itself to prove the value of para-dichlor. as a fumigant for cane-grubs.

Successful in Spite of Disadvantages.

I may state that these plots were situated on a ridge of high land composed of friable red volcanic soil; that the cane on the area selected for treatment had not ratooned well, owing to injury during the previous season from grubs and dry weather; and, moreover, gaps of several feet occurred in places, while in other parts of these experiment plots the ratoons were weakly or stunted both on the treated and check areas.

The cane was cut about the middle of September, seven and a-half months after injection with para-dichlor., during which period it received less than half our average amount of rain. In spite of prolonged drought, however, poor cultural conditions, and the other drawbacks already mentioned, the rows of treated stools continued to the last to be greener, more upright, and considerably higher than those alongside on the control areas.

How Para-dichlor. was Procured.

It should be mentioned here that the fumigant in question was first obtained from Germany by the Agricultural Chemist, Mr. J. C. Brünnich, F.L.C., who subsequently handed a sample to the present Director of the Sugar Bureau. This was sent to the Gordonvale laboratory to be tested in connection with cane-grub control. At that time (1915), when initial experiments were carried out by the present writer, and proved successful, para-dichlor. had never been experimented with in other

countries as a possible remedy for root-eating scarabæid cane grubs; so that we may claim to have been the first to discover an effective fumigant which bids fair to be of great value as a controlling factor against one of the most notorious insect enemies of sugar-cane.

Ratooning of Treated Rows.

In conclusion, it may be stated that about a month after harvesting the cane on our Meringa plots it was noticed by Assistant H. Knust that the stools treated ten months ago had ratooned in a normal, uniform manner along these rows, whereas in the lines of untreated cane scarcely any ratoons had appeared, while the few present here and there were noticeably small and weakly, indicating plainly that the roots of these control stools had been more or less destroyed by grubs.

Entomological Exhibit at Ingham.

The Sugar Bureau was represented this year for the first time at the Annual Show of the Herbert River Farmers' League, held at Ingham on 21st and 22nd September, by an Entomological Exhibit which included some of our best diagrams and showcases, lately executed by the writer for our Museum at Meringa Laboratory.

This economic display was committed to the care of Mr. Dormer, and owing to its unique character naturally attracted considerable notice, and was evidently much appreciated by growers in the district.

BREEDING AND LIBERATION OF TACHINID FLIES.

This work is progressing favourably, and at the present time one of our breeding-cages contains a large number of canes that harbour pupæ of this parasite, from which the flies are expected to emerge in considerable numbers during the next few weeks.

On the 19th ultimo Mr. G. Bates (Assistant to Entomologist) was sent to South Johnstone to liberate sixty parasites on plantations affected by the beetle-borer (*Rhabdocnemis obscuris* Boisd.).

Thirty-three of these were let go on the selection of Mr. Darviniza, and the remainder among Mr. Moule's cane at Miskin's Point.

Judging by information gathered by Mr. Bates, this cane-borer is to be met with over a very large portion of the South Johnstone district, the names of no less than sixty growers who are troubled with this pest having been obtained from the Chief Cane Inspector.

This is a serious matter, and an endeavour will be made without delay to control the ravages of this destructive cane-weevil.

Cane-grubs have not done much damage this season on the Johnstone, and other insect pests affecting the cane are of minor economic importance.

DRIED GRUBS AND BEETLES AS A POULTRY FOOD.

Whilst in Sydney recently I submitted samples of dried grubs and grey-back beetles to Mr. A. Le Souef, Curator of the Zoological Gardens, and we visited cages containing various insectivorous birds, &c., to see if they would eat the grubs when broken into small pieces.

Mr. Le Souef subsequently found that they preferred them in a softened condition, and in a letter just received from him he writes:—

> "The grubs that you left were very good food, and when soaked were readily taken by our insectivorous birds. We would be glad if you would quote for the food at per pound. We might be able to use about 100 lb. per annum."

I might mention that when discussing this matter with the Curator he told me that there was a sure market in Sydney for such dried grubs, and we would have no difficulty in disposing of large quantities at a good price. The price per pound would be determined by the amount of trouble and time involved in the process of drying and packing the grubs. It seems to me that growers who collect them when ploughing might just as well turn them to profitable account as throw them away or let birds eat them.

Since it takes about 3½ lb. of fresh grubs to make 1 lb. of dried, a fair price for the latter commodity would be from 2s. 6d. to 3s. per lb.

RED POLL CATTLE.

To-day Red Poll cattle are among the favoured breeds in the dairying counties of Great Britain and in all the provinces of Ireland. They are established and esteemed in America, South Africa, the islands of the Pacific, New Zealand, and Australia.

In Queensland a notable Red Poll herd has been founded by Mr. E. J. McConnel, at Marshlands, Wondai. At the last Brisbane Show, Red Polls were not the least interesting entrants in the cattle classes, and representatives of the Marshlands herd won championship ribbons.

They have proved their worth for high quality milk production and butter and cheese making; also their excellence as beef producers. These and other utility characteristics have contributed to a widely growing interest in the Red Poll breed.

Possessing the good points of a dairy animal, and being able to hold its own with the best beef cattle, it is only natural that the Red Poll should continue to make steady progress in popular favour. Among those who have come into the Red Poll ranks are many one-time owners of heavy milking cattle, who have been impressed by the general utility character of the breed. They are finding what is so important to the general farmer to-day that cattle are invaluable if a uniformly high percentage of butter-fat always in the region of 4 per cent. can be relied upon, and if early maturity in the steers can be looked for. These considerations have contributed to the increasing interest in the Red Poll breed.

Origin of the Breed.

Pedigree Red Polls were selected originally from poll cattle highly esteemed in the eastern counties of England. Many of the foundation stock were red, but many more were variable in colour. In appearance they were generally like de-horned Shorthorns. The blood-red colour was held in the highest favour, and many farmers in Suffolk and Norfolk were found early in the last century to have herds entirely red and to have been careful to breed from red bulls.

There is no record of any Red Polls kept in any other counties in Great Britain at the time when pedigrees were first listed. An old strain of this breed exists in a remote part of Austria. These, no doubt, are descended from animals of the Elmham herd, in Norfolk, exported in 1869 to infuse fresh blood into native-bred cattle.

Records show that Red Polls existed in Suffolk in 1792, and earlier than that reference was made to the butter they produced being "the pleasantest and best in England." In those days little if any attempt was made to improve the breed until the agricultural societies were established and premiums offered for Suffolk cattle pure bred—*i.e.*, by a Suffolk bull *ex* a Suffolk poll cow.

Although there were poll cattle of various colours both in Norfolk and Suffolk, the red was held in highest esteem as long ago as 1782. In a "Rural Survey of Norfolk" about that period, the native cattle are described as "a small, hardy, thriving race; fatting as freely, and finishing as highly at three years old as cattle in general do at four and five."

The establishment of separate classes for Norfolk poll cattle at the agricultural shows in that county gave great impetus to the improvement of this stock.

Red Polls are recognised to be a smaller breed than Shorthorns, Friesians, South Devons, or Herefords. An average cow's height is 4 ft. 2 in., and girth 6 ft. 6 in. They are docile and feed without fuss. The beef is of the same value as that of the Aberdeen Angus.

The breed is growing in Australia and a Red Poll Society has been established. Australian breeders claim that the breed possesses dual purpose characteristics, blending butter and beef qualities perfectly. In 1921, the champion cow at the London Dairy Show was a Red Poll, and the champion fat bullock was her calf. In the "Journal of the Ministry of Agriculture" (U.K.) for last August, R. Harvey Mason submits the following observations on the breed:—

Milk.—The Red Poll is distinctly a dual purpose animal, producing the best beef and rich milk. The milk yield varies from 5,000 to 12,000 lb. in a year, and owing to milk recording, a good trade for high-grade milkers (which at first did not exist), and the breeding from bulls bred from prize-winning cows at dairy shows, milk records are fast improving. The butter-fat testings show 3.5 to 4.1 per cent. of butter-fat, and even up to 5 per cent. in some cases.

Up to about 1890 the principal trade was for exhibition and export. Americans north and south wanted fine meat and extra good looks, and consequently breeding followed those lines, little attention being paid to milk. This began to alter soon after the Chicago exhibition in which there were prizes for good milkers, and some buyers came over to select a few specially good-milking cows which were to give at least 4 per cent. of butter-fat. These men showed the farmers how they should buy cows. They went to the early and late milkings and each time brought a Babcock tester, and tested the milk. This was long before milk recording was carried on as it is now.

Beef.—Red Polls have been always noted for the prime quality of the beef they produce. Graziers have generally obtained 1s. or 2s. a stone more than butchers will give for larger breeds. At the present time there is considerable inquiry for small joints, and Red Poll steers sell well both as stores and finished meat. At a Smithfield Club show weights as follows were recorded:—

	Years.	Months.	Days.	Weight. cwt.	qr.	lb.
Red Poll Steers under 3 years	1	4	4	11	3	27
	2	10	16	15	2	26
	2	10	18	16	2	23
Heifers under 3 years ..	2	10	14	15	3	9
Steer under 2 years ..	1	10	3	11	3	27
	1	9	8	12		

Description.—The following is the standard description of the breed:—

Characteristics and Form—

Colour:—Blood-red; deep red for preference; tip of tail and udder may be white.

Head:—Must be poll, *i.e.*, not artificially polled and without horn, slugs, or abortive horns.

Nose:—White.

Hips:—Evenly rounded; not prominent.

In all other particulars the commonly accepted points of a superior animal to be taken as applying to Red Poll cattle.

Objections—

Any extension of white in front of the udder.

Any white on a bull except on tip of tail.

A cloudy or dark nose.

Disqualifications—

Any horns, slugs, or abortive horns.

Any signs of artificial polling.

A black or blue nose.

Any white except on the tip of the tail, the udder, or for a short way under the body.

Any colour other than red.

Notes on the Marshlands Herd.

About twenty-five years ago Mr. E. J. McConnel, of Marshlands, near Wondai, in the South Burnett, while visiting England, was much impressed with the quality of a live shipment of Red Poll bullocks from Canada. Back in Queensland after the 1902 drought he observed that one of his neighbours had lost fifty-one out of fifty-two Shorthorn bulls and only one out of thirty Red Polls. His interest in the breed revived. Later he established a Red Poll herd on the Marshlands pastures. During recurring dry times the Marshlands Red Polls have proved good doers, and when trough watering became necessary their docility and lack of "rowdiness" saved the station hands a lot of trouble. As milkers, butter, and beef producers they continue to uphold the Red Poll reputation. Disease amongst them is unknown.

Photo. F. B. McConnell.]

PLATE 97.—ROYAL FARMER.

The property of Mr. E. McConnel, Marshlands, Wondai, as he was greeted on his return from the Brisbane Show, having won First Prize and Champion in the Red Polled Class.

Some years ago Mr. McConnel imported a number of cows from the old country. Since then several imported bulls have been added to the herd, the last two being "Royal Farmer" (pictured above), a grandson of "Waxlight II.," and "Red East," a great grandson of the same cow. "Waxlight II." took first and champion in England in 1904 to 1910, and in her last show—the R.A.S. of England—was first and champion and third in the milking test. This record emphasises the dual purpose qualities of her breed. Quietness, quickness, intelligence, and good mothering qualities of the cows are notable characteristics of the Marshlands Red Polls.

Photo. F. B. McConnel.]

PLATE 98.—ROYAL FARMER'S SON BEING CONGRATULATED ON HIS WIN AT THE BRISBANE SHOW.

Photo. F. B. McConnel.]

PLATE 99.—ANOTHER SON OF ROYAL FARMER COCKS A CASUAL EAR TO HIS VISITOR.

Photo. G. B. Brooks.

PLATE 100.—EIGHT-LOCK COTTON BOLL FROM MOUNT LARCOM DISTRICT.

The usual number of locks found in cotton bolls of American type in Queensland is either four or five, and the boll depicted is an interesting departure from the normal.

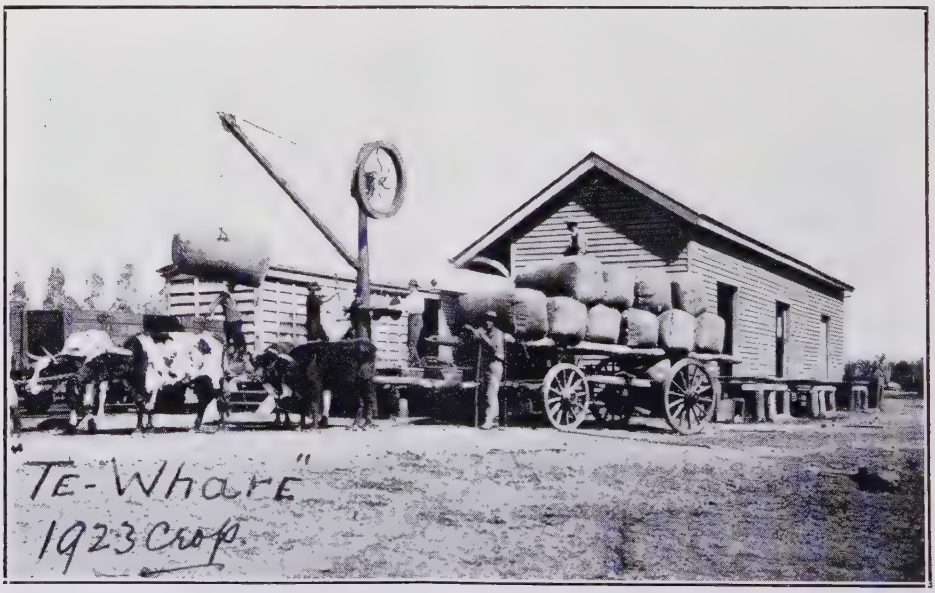


PLATE 101.—COTTON FROM TE-WHARE, MR. GEO. W. ROSEBY'S FINE PROPERTY IN THE WONDAI DISTRICT.

Mr. Roseby had the largest one-man ploughed cotton area in Southern Queensland—42 acres—this season. Average weight per bale, 586½ lb.

General Notes.

State Wheat Board Election.

The following nominations have been received for membership of the State Wheat Board for one year as from 2nd December, 1923:—

R. Swan
A. J. Harvey
B. C. C. Kirkegaard
T. Muir
J. T. Chamberlain

As there has been no opposition the whole five are elected, but the actual appointment of the Board has yet to be confirmed by the Governor in Council. All nominees have held office on the Board for the current year.

Tomato Pool.

A notice of intention of His Excellency the Governor to create a Tomato Pool for the Stanthorpe District appears in the "Government Gazette" of the 3rd November. The pool will be run on similar lines to the one which operated at the beginning of the year. The new pool will operate from the 7th January to the 26th April, 1924, and will apply to all tomato-growers in the Stanthorpe District, with the exception of those growers who deliver their tomatoes to a co-operative factory within the district. The franchise for the pool is given to those persons who grew tomatoes last season or who have transplanted plants for the coming season. The Board to administer the pool will consist of three members. An Order in Council extending the term of office of the members of the present Tomato Pool Board to the 15th November has also been gazetted. This extension is given in order to allow the Board time to finalise the accounts of the last pool.

Queensland's Future—A Southern View.

Thus a writer in the "Australasian" (20th October, 1923) in the course of a review of the fruit industry in Queensland:—"The future certainly appears brighter than for many years. The change has been brought about by the Government of the State having realised that the fruit industry is capable of great development. Grants to the Department of Agriculture have increased from time to time, and again this year the amount has been added to by approximately £50,000. Steps have been taken to enable investigation to be made of the causes which have operated against the success of the industry. Last year an officer was appointed to devote special attention to this branch of the departmental activity. Then followed the appointment of an instructor in packing, and the carrying out of demonstrations and lectures dealing with the different phases of the industry. These changes are having their effect, and, as a consequence, those engaged in the industry are giving much increased attention to the cultivation, manuring, and general management of their properties. Nurseries have been established by the Government, at which new varieties are being propagated, and efforts are made to improve commonly grown kinds of fruit. At one of these some thousands of trees of the Avocado pear are being propagated, with a view to testing its commercial value. In the southern zone apple and other deciduous fruit trees are being planted over a wider area, whilst the question of erecting packing houses is receiving attention. All these activities indicate that fruit culture is likely to make pronounced progress in the immediate future."

Queensland Fruit in the South—Clamant Need of Market Organisation and Advertisement.

The same writer continues:—"The outstanding feature of the fruit industry is the little attention that has been given to the creation of a Southern market for the disposal of the more delicate fruits, such as the pawpaw, custard apple, granadilla, and the mango. These fruits are prominently displayed in the Sydney shop windows, and, to a far less extent, in Melbourne. The Queensland grower does not appear to have fully realised the possibilities of these fruits, and it may truthfully be said that the retailer has not extended the assistance that might be expected of him when consignments have to be made. The high prices have, in place of popularising these fruits, caused them to be regarded more as some freak product, that is placed in the window more for dressing purposes than for the purpose of sale. A well sustained advertising campaign, backed up by regulation of supply, would do much to bring these fruits into considerable popularity. Last season Tasmanian orchardists instituted a 'Sturmer' week in Sydney, and as a result of the window displays and inducements offered to retailers and barrowmen to push the sale of the fruit, 80,000 cases of this apple were sold within a week. A campaign on somewhat similar lines would do much to develop a permanent market for the more delicate tropical fruits."

Top Rot of the Sugar-cane.

Bulletin No. I. of the Division of Pathology, issued by the Bureau of Sugar Experiment Stations, and covering an inquiry into the nature and origin of a disease affecting sugar-cane in the Herbert River and other districts of Queensland, by Mr. Henry Tryon (Plant Pathologist and Entomologist, Department of Agriculture and Stock), is now available for distribution to sugar-growers and others interested.

Wheat Board—Insurance.

A Proclamation has been issued under "*The Wheat Pool Act of* 1920." This Proclamation provides that the Wheat Board, for the purpose of insuring wheat against damage by fire, shall be deemed to have and retain an insurable interest in all wheat retained by the growers for feed or seed purposes, or wheat which is sold by the Board to growers for either of these purposes.

Disparities Revealed by Testing.

The economic significance of records in relation to the production of dairy cows is well illustrated by figures obtained from tests carried out at Utah Agricultural Experiment Station. The "International Review of the Science and Practice of Agriculture" sets out the quantities and values in currencies not familiar to other countries, but the differences between the yields of the cows which were proved to be the best and those proved the worst are equally arresting, whether stated in kilogrammes or in pounds.

The records of twenty-six herds of dairy cows for a biennial period ending in 1913 proved that the difference between the annual production of butter of the best and the worst cow of a herd ranged from 18 to 148 kilogrammes. There was no correlation between the production of the first three months and the annual production. There is a decrease in yield when the cow remains dry for more or less than two months. A dairy cow of a good breed shows a marked tendency to long lactation; she is as superior to a poor cow in annual butter production as in butter production during the first month.

Comparison between the best and the worst herd showed that the annual butter production of the best herd was 149.9 kilogrammes as against 89.4 for the worst. The cost of feed per annum was 229.01 francs as against 177.29, leaving a profit on the cow of 362.57 francs for the best herd, as compared with only 174.18 for the worst.

Importance of Standard Grades—A Warning to Fruitgrowers.

The importance of obtaining satisfactory markets for our fruit is being constantly brought under the notice of fruitgrowers, not only in this State, but generally throughout the Commonwealth, and it has been pointed out over and over again in the Press and otherwise that the only way to obtain and retain markets is to ensure that the quality of the fruit supplied is up to the standards set.

The importance of this has been recognised by the Council of Agriculture by its decision on the advice of the Banana Advisory Council, to recommend to the Government the fixing of standard grades for Cavendish bananas. These suggestions were approved by the Government, and in February last Regulations which provided that cases containing fruit must be clearly marked with the grade of their contents were gazetted. Unfortunately, some growers do not even yet realise the importance of their so grading their fruit or the injury, either wilfully or through ignorance, that they do their fellow-growers by improper grading.

An instance of improper grade marking was recently brought to the notice of the Department of Agriculture. A case of bananas marked "Firsts" (which means that the fruit must not be less than 7 inches in length or less than 4 inches in circumference) contained half-size fruit. The consignment was not a credit to Queensland, and in sending it to the Southern markets the offending grower undoubtedly helped to seriously prejudice buyers there against Queensland bananas. The fruit referred to and marked "Firsts" was so small as to be below any grade standard and quite unmarketable.

Growers are again warned that the grade standards, as provided for by Regulation, must be complied with, and that the markings on the case must be a true description of the grade of the fruit contained therein, and that inferior fruit must on no account be graded and marked "Firsts."

Banana-growers are, therefore, again advised to be more careful in the grading of their fruit, and to be absolutely certain that the fruit packed in a case is in accordance with the grade standard marked thereon. If this is done the confidence of the buyers will be secured and there will be no difficulty in disposing of our fruit.

Do Thunderstorms Affect Milk?

It is a popular belief that thunderstorms sour milk, a belief so widespread that it would seem there must be some foundation for it. It is questionable, however, whether there is really any connection between the thunderstorm and the souring of milk. That souring frequently occurs during a thunderstorm cannot be doubted.

After much experimenting with electric sparks, &c., scientists have come to the conclusion that bacteria grow most rapidly in the warm, sultry conditions which usually precede a thunderstorm, and it will frequently happen that the thunderstorm and the souring occur together, not because the thunder has hastened the souring, but rather because the climatic conditions which have brought the storm have at the same time been such as to cause unusually rapid bacterial growth.

Dairymen find that during hot, close weather, even when there is no thunder, it is just as difficult to keep milk as it is during thunderstorms, and they also find that scrupulous cleanliness in regard to the milk vessels is a good remedy against souring during a storm. It is safe to conclude, therefore, that in all cases it is the bacteria which sour the milk, and if there seems to be a casual connection between the souring and thunder it is an indirect one only. Milk should be cooled as soon as possible after milking, when it will keep sweet for a reasonable period, while milk deprived of bacteria will keep well during thunderstorms.—"The Dairy."

Government Clydesdale Sires.

The Minister for Agriculture and Stock (Hon. W. N. Gillies) has made available for public information the report of arrangements and investigations for this season made by the Stallion Committee appointed in connection with the Clydesdale sires purchased by the Government to help towards the improvement of draught stock in Queensland. Applications for the use of these stallions were received from districts other than those to which a horse has been allotted, but, as the number of horses is limited, it is impossible to accede to all requests this year. The sires have been allotted as follows:—

"Glenalla"—Rosewood, Marburg, and Rosevale.

"Fabrie's Heir"—Boonah and Harrisville.

"General Wallace"—Clifton, Allora, Warwick, and Nobby.

"Premier Again"—Wallumbilla and Roma.

"Bold Wyllie"—Nanango, Kingaroy, Wondai, and Murgon.

"Baron Again"—Gympie, including the Mary Valley.

As it was originally the intention of the Stallion Board to allot a stallion to the Oakey district, taking in the Cecil Plains line, an inspection was made of the mares submitted in and around these centres. Full publicity as to the date and time of the inspection was given in the local papers, but owners of mares failed to respond to the opportunity. It was ascertained, however, that the dry weather conditions were largely responsible for the poor response. This district has suffered severely from the drought, and most of the working stock is now on relief country. While it is regrettable that a horse is not available for these districts this season, it is fully realised that farmers more favourably situated should, under the circumstances, have the benefit of the services of the sires.

The Boonah residents, being desirous of securing a horse for their district, took upon their shoulders the responsibility of guaranteeing a full season for a horse as well as the total amount of the service fees. Accordingly, upon representation being made to the Department of Agriculture by stockowners in that territory, an inspection of mares was made, and of the sixty-eight submitted, fifty-eight were accepted. Within the Rosewood, Rosevale, and Marburg district, sixty-eight mares were inspected, and of this number fifty-eight were accepted. The Clifton district responded with a total of eighty-five mares, and of this total sixty-five were accepted. The residents of Wallumbilla and Roma submitted seventy-two mares for inspection, and out of this number only ten were refused. In the Kingaroy district, seventy-seven mares were brought forward for inspection, and fourteen refused. Four mares came forward from Goomeri, but as it is rather far to travel a horse to Goomeri for only four mares, it was deemed advisable by the Board to leave these mares out of the complement for the horse allotted to the Kingaroy district, but the owners of same may secure his services if they provide paddock accommodation for their mares at, say, Murgon. Fifty-four mares were brought along for inspection in the Gympie and Mary Valley district, and of this number forty-eight were passed as eligible.

The fact that a mare has been rejected does not signify in some cases that she is unfit as a breeder, but owing to the number submitted, it was found necessary to limit owners to one mare each where advisable.

Appointments.

W. C. Keany has been appointed Poultry Instructor, Department of Agriculture, and commences duty on Monday next.

J. Carew has been appointed Senior Field Assistant on probation, Cotton Section, Department of Agriculture and Stock.

A. A. P. Daniels has been appointed Learner, on probation, Chief Office, Department of Agriculture and Stock, as from 17th October.

A Bad Policy.

Complaints are still being received by the Director of Fruit Culture (Mr. A. H. Benson) that bananas are being sent to country centres in a very immature condition. Mr. Benson advises that this is bad policy on the part of the growers, for not only do they obtain a comparatively small price for the fruit, but the practice is bound to react on the sender. Immature fruit tends to put buyers off, and consumption is thus limited.

Stacked Silage—A Marburg Farmer's Forethought.

The value of conserving fodder has again been illustrated, this time in the Marburg district. Incidentally, it is shown that stacked silage will, with care, keep longer than a year.

The Instructor in Agriculture (Mr. A. E. Gibson) has received a letter from the Inspector of Dairies (Mr. A. K. Henderson), of Rosewood, in which it is stated that when in the Marburg district a few days ago he visited the property of Mr. S. Smith, of Woodlands, to see the ensilage stack. In May, 1920, Mr. Henderson supervised the erection of this stack, putting in a crop of wilted corn, some of which was so dry that it had to be watered. After nearly three and a-half years there was about 18 inches of waste on the ends and sides, and about 9 inches on the top. More than half of the crop of waste corn had been saved as good fodder, the ensilage being of good quality. Mr. Smith said that he was so satisfied with the results that he had arranged for the erection of a concrete silo this year. He had fed a herd of twenty-six milkers for three weeks and had enough silage left for another week at least.

Mr. Gibson adds that the fact that stacked ensilage will keep much longer than twelve months, obviates the need of erecting a rather costly concrete silo, and removes any excuse for neglect by the farmer to lay by in the years of plenty for the dry period which invariably recurs. The conservation of ensilage should, like the making of hay, be regarded as an annual job.

I.M.S.—Conditions of Herd Book Entry.

The hon. secretary of the Illawarra Shorthorn Society of Australia (Mr. R. S. Maynard) writes:—"Every now and then I get inquiries as to the conditions of entry in the Illawarra Milking Shorthorn Herd Book of Australia, and I think it might be useful to your readers if you allowed me to set down the conditions as they are to-day and as they will be after the end of this year.

"At the present time a cow or heifer is eligible for registration if she be of good type and conformation, and if it be shown to the satisfaction of the Society's inspector that her sire and dam and grandsire and grandam on both sides are or were of good Illawarra Milking Shorthorn type and breeding. In addition, this cow or heifer must pass a certain butter-fat test.

"A bull is eligible for entry if he have similar pedigree qualifications, if he pass inspection on type, and when four of his daughters are registered.

"This condition of entry will not obtain after the 31st December, 1923. From the 1st January next there will be accepted only animals which are the progeny of animals already registered, but the Society will accept, for its Grading-up Register, any cow without pedigree which passes inspection on type. The principle of this Grading-up Register is that a man must use a registered bull on his foundation cows and on succeeding generations, and that he will be able to register the great-great-grand-daughter of his foundation cows in the Herd Book.

"I shall be very happy to send full particulars of this grading-up system to any of your readers who considers that he has first-class unpedigreed cows of this breed and who would like to grade them up for the Herd Book. The Society exists for the improvement of the breed in Australia and for recording the pedigrees and desirable qualities of the specimens of the breed. It is anxious to further the interests of breeders of Illawarra Milking Shorthorn cattle."

A College on Wheels.

"The people greatly appreciate this form of instruction," is a sentence in an interim report from Charleville received by the Minister for Education (Hon. John Huxham) in regard to the work of the travelling domestic science rail car, which is now operating on the Western line. Mr. Huxham states that the scheme is proceeding satisfactorily. The second car is expected to be ready almost immediately, but in view of the close approach of the Christmas vacation this car will not be put into commission in the North until the New Year.

Co-operative Associations Act—Ministerial Statement.

The Hon. W. N. Gillies (Minister for Agriculture and Stock), in the course of a recent Press statement in reply to some criticism of the Co operative Associations Act, said that, in respect to the suggestion that the measure involves repudiation because it provides for members present at a meeting to have one vote only, all practical co-operators or students of that movement will agree that the one member one vote principle is universally accepted wherever true co-operation is in existence. As stated by him in the House, co-operation is an association of individuals for a common purpose and is not an association of capital for profit; that being so, the voting should be according to the number of individuals and not according to the capital interest in a co-operative concern. Some objection had been taken to the Act being made applicable to companies at present in existence and designated as "co-operative." If these had not been embraced in the Act the position would be that two classes of co-operative companies would have come into existence in Queensland—viz., companies formed under existing Acts and companies registered under the Act which had now been passed by Parliament. The former Acts make no provision for producers' co-operative movements, and there is no restriction whatever in respect to the use of the designation "co-operative." The new Act lays down well-defined and well-understood co-operative principles. The two sets of co-operative companies which would exist if those already formed had not been brought under the operation of the new Act would be found to be working along entirely different lines, with policies in conflict. In short, spurious co-operation would be in antagonism to *bonâ fide* co-operation, a state of affairs which on principles of right and justice it is not desirable should be tolerated. There was no shadow of doubt that primary producers do not desire such a state of affairs to obtain, and in their interests and at their request the Act was designed to bring the whole producers' co-operative movement into line. In doing so the Act imposes no measure of Government control, nor does it involve any repudiation of the decisions of producer shareholders. It confers upon each co-operative association complete local autonomy, with freedom from interference of any nature whatsoever so long as co-operative principles are maintained. Many of the provisions in the new legislation to which exception had been taken are not obligatory but optional—*i.e.*, certain rigorous provisions for co-ordination of the producers' interests are in the Act for them to use if they desire to use them, but there is no provision for the Government utilising these provisions to coerce the producers, an assertion which he emphatically contradicted.

It is true that clause 24 of the Act, in providing for the calling of a meeting of companies already in existence to determine whether or not they shall come under the new Act, lays down that the voting to determine this question shall be on the basis of one member one vote, but it is contended that the majority of individuals interested in the company should determine this important question and that it should not be determinable by vested interests. The financial interests of "dry" shareholders are not prejudiced by this clause, and, lest any instance arises wherein such prejudice may be deemed to accrue, the Act seeks to make the following generous provisions, viz.:—

(1) That the section shall not apply to any existing company exempted by the Governor in Council on the recommendation of the Council of Agriculture.

(2) That exemption be granted in respect to the use of the name "co-operative" by *bonâ fide* co-operative trading companies registered under the Industrial Provident Societies Act.

(3) Complete and generous provision for surrender of shares.

The Minister, therefore, unequivocally denies the allegation that the Bill involves repudiation, and takes very strong exception to the way in which certain interests apparently opposed to the primary producers have sought to misrepresent the measure and those who have been seeking to bring it into effect.

Gympie District Progress.

Following are the September statistics of produce and values supplied by the Gympie and District Progress Association:—

	£
Butter manufactured, 270,197 lb., for which suppliers were paid	21,129
Timber, 3,355,682 s. ft., valued at	28,355
Fruit, bananas, pineapples, and pawpaws	20,596
Cape gooseberries, 31,014 lb.	675
Agricultural produce	19,829
Pigs, 1,078, realised	4,022
Gold, 306 oz., valued at	1,040
Lime	137
Total value of products approximately	£95,783

Children and the Food Value of Milk.

From experiments carried out under the supervision of the medical officer of the Birmingham educational authority, a very instructive demonstration of the nutritive value of fresh milk has resulted. Thirty children of both sexes, aged from seven to eleven, selected from the scholars of a Council school, were given an additional daily ration of a pint of milk. After four months it was found by medical examination and ordinary observation that a rapid and notable improvement in physical and mental vigour, with an accelerated increase of weight, had occurred. The discontinuance of this addition to the children's dietary led within a month to a marked cessation of progress, a conclusive confirmation of the positive results of the four months' experiment. The value of pure fresh milk and the need for a much greater consumption in the country are constantly receiving such testimony. Milk supply, like housing, forms one of the most pressing social questions confronting the nation. Within the administrative functions of the Ministry of Health and Board of Education there is much scope for concerted action to secure the fullest possible use of this food so essential for the national wellbeing.—"The Dairy."

KILLING OF GREEN TREES WITH ARSENICAL POISON.

The trees to be killed with arsenical poison are first rung or "frilled," by making downward cuts with the axe completely round the tree, each cut well overlapping the adjoining one, so as to leave absolutely no unsevered section of bark in which the sap could flow. The cuts must be made right through the bark into the wood proper and as close to the ground as possible, say from 6 to 12 inches up. The poison prepared as given below is poured into this frilling, right round the tree, using an old teapot or kettle, as the spout makes pouring easier and prevents wastage of solution. A large tree of 4 feet diameter may require about one quart of the solution, smaller trees proportionately less. Small saplings and suckers may be cut off level with the ground and thoroughly swabbed with the poison.

Trees may be killed by ringbarking or by frilling combined with poisoning at any time, but unless a suitable season is chosen suckering is likely to take place. From May to July is probably the best period of the year to carry out the work successfully. In the winter months the sap is assumed to be down, and therefore the end of autumn and during the winter the trees and undergrowth are more easily killed.

Preparing the Poison.—The arsenic may be dissolved with the aid of caustic soda or washing soda; when using the latter, boiling from half an hour to one hour is necessary before all the arsenic is dissolved.

Under ordinary circumstances 1 lb. of arsenic and 3 lb. of washing soda or 2 lb. caustic soda to 4 gallons of water is of sufficient strength to kill timber, but when it is a question of making doubly sure and killing more quickly in the case of vigorous saplings the solution can be used double strength.

The preparation and mixing is best done in an empty kerosene tin, which holds 4 gallons. When using caustic soda mix 1 lb. of arsenic and 2 lb. caustic soda thoroughly in the dry state and add gradually and carefully water.

Sufficient heat is generated to dissolve the whole of the arsenic; make up to 4 gallons, and finally stir in ½ lb. whiting, which latter indicates readily which trees have been treated. If washing soda is used mix 1 lb. of arsenic and 3 lb. of washing soda into a paste with some water, add about 2 gallons of water, and boil for half to one hour until all arsenic is dissolved; make up to 4 gallons, and add the whiting.

There is not much danger to stock grazing on areas treated by poison, and the leaves fallen from the poisoned trees would not contain any poison, but it is safer to keep the stock off such areas for some weeks, as they might lick some of the poison from the frills on account of the salty taste.

Answers to Correspondents.

Peanuts—Millet.

D.B.H. (Goodnight Scrub)—

(1) This depends entirely on the amount of natural food present. Under ordinary conditions, peanuts are troubled by bandicoots and kangaroo rats; wallabies will take to the same crop if the amount of their natural food is lacking, and will in most cases cause damage to broom millet.

(2) Where conditions are favourable it is possible to produce up to 1 ton per acre of peanuts, but 14 to 16 cwt. may be regarded as a good return. Values vary according to the demand, but 3d. to 4d. per lb. may be regarded as the average price.

Broom millet will give a yield, under favourable conditions, of from 14 to 18 cwt. per acre, the present value of this class of material being £35 to £40 per ton for prime hurl.

(3) Four to 5 lb. sown thinly in drills spaced 3 feet apart.

(4) Only one crop may be harvested from one planting of millet.

(5) Not advisable to use garden seed planters in scrub land unless your surface soil is absolutely free of all roots, otherwise breakages will constantly occur to machine, which is not intended for rough usage. The ordinary hand maize planter used on new scrub burns might suit your purpose. It all depends on what seed you want to sow; otherwise the ordinary planter's hoe would do. It usually takes about five years after falling for scrub roots to rot.

How to Make Tanglefoot.

Several inquiries having been received regarding the best way to make tanglefoot, the queries were referred to the Agricultural Chemist (Mr. J. C. Brünnich), and that officer recommends the following recipes:—

(1) Melt together 8 parts of resin, 4 parts of turpentine, 4 parts of rapeseed oil, and half a pint of honey.

(2) Boil to a thick paste 1 lb. of resin, 3½ oz. of linseed oil, and 3½ oz. of molasses.

(3) Carefully boil linseed oil until it becomes syrupy and tacky on cooling.

When using tanglefoot on the trunk of a tree to prevent insects from crawling up, it is advisable to smear the tanglefoot on a bandage of strong brown paper rather than on the trunk itself. Tanglefoot is recommended to prevent young orange bugs that have been shaken or otherwise driven from the tree on to the ground from again climbing up into the tree. It is also useful to prevent leaf-eating caterpillars, such as those that defoliate white cedars, from crawling up the trunk of the tree, as these caterpillars are night feeders —hiding during the day near the base of the tree and crawling up the trunk at night to feed on the leaves.

Orchard Notes for December.

THE COASTAL DISTRICTS.

The planting of pineapples and bananas can be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weed of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple-growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime-sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Early ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless

for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codling moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste. It is better to get a good price for half the crop and destroy the balance than to rush the whole on to the market and get little or nothing for it.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

Vegetables will require constant attention in the Granite Belt area. Tomatoes and potatoes will require to be carefully watched in order to prevent loss from Irish blight, and no time should be lost in spraying these crops should this disease make its appearance in any part of the district, as it can be prevented by spraying with either Bordeaux or Burgundy mixture. These fungicides effectually protect the plants to which they are applied if used in time. If leaf-eating insects, such as beetles, grasshoppers, and caterpillars, are doing damage as well, add 3 or 4 lb. of arsenate of lead to the 100 gallons of spraying mixture used for the prevention of early and late blight (potato macrosporium and Irish blight), so that the one application will be effectual for both classes of diseases.

Keep all kinds of vegetables well worked, stirring the land frequently to retain moisture, and taking care to prevent the formation of a surface crust should rain take place. Remember that vegetables require plenty of moisture; therefore leave nothing to chance, but do your best to retain all the moisture in the soil you possibly can.

Farm and Garden Notes for December.

Although November is regarded generally as the best period for planting the main maize crop, on account of the tasselling period harmonising later on with the summer rains, December planting may be carried out in districts were early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of silage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resistant. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state, consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windrows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary, otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway where this season's patchy rain has fallen and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

Kitchen Garden.—Gather cucumbers, melons, vegetable marrows, and French beans as soon as they are fit for use. Even if they are not required, still they should be gathered, otherwise the plants will leave off bearing. Seeds of all these may be sown for a succession. Tomatoes should be in full bearing, and the plants should be securely trained on trellises or stakes. Where there is an unlimited supply of water, and where shade can be provided, lettuce and other salad plants may still be sown. All vacant ground should be well manured and dug two spits deep. Manure and dig as the crops come off, and the land will be ready for use after the first shower.

Flower Garden.—Keep the surface of the land well stirred. Do not always stir to the same depth, otherwise you are liable to form a "hard pan," or caked surface beneath the loose soil. Alternate light with deep hoeings. A few annuals may still be planted, such as balsams, calendulas, cosmos, coreopsis, marigold, nasturtium, portulaca, zinnia, and cockscomb. Plant out whatever amaranthus may be ready. These may still be sown in boxes. Clear away all annuals which have done flowering. Bulbs should have all the dead leaves cut away, but the green leaves should not be touched. Stake chrysanthemums, and, as the flower buds develop, give them weak liquid manure. Coleus may now be planted and propagated from cuttings. Dahlias are in various stages, but the greater part will have been planted by this time. Give them liquid manure, and never let them dry up. Lift narcissus about the end of the year, but do not store them. Plant them out at once in their new positions. Top-dress all lawns.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING SEPTEMBER, 1923 AND 1922, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of Years' Records.	Sept., 1923.	Sept., 1922.
North Coast.				
	In.		In.	In
Atherton	0·60	22	...	0 03
Cairns	1·69	41	0·05	0·44
Cardwell	1·45	51	0·33	0·10
Cooktown	0·58	47	...	0·17
Herberton	0·48	36	0·07	0·12
Ingham	1·29	31	0·04	1·75
Innisfail	3·65	42	0·78	2·13
Mossman	1·17	15	...	0·45
Townsville	0·79	52	0·03	0·22
Central Coast.				
Ayr	1·52	36	1 38	0·04
Bowen	0·83	52	...	0·25
Charters Towers ...	0·79	41	0·01	0·09
Mackay	1·63	52	...	1·58
Proserpine	2·29	20	0·05	0·30
St. Lawrence ...	1·33	52	...	0·73
South Coast.				
Biggenden	1·69	24	1·21	0·45
Bundaberg	1·77	40	1·80	0·52
Brisbane	2·08	72	1·21	3·35
Childers	1·95	28	1·21	0·45
Crohamhurst ...	2·71	30	1·45	3·28
Esk	2·32	36	0·85	2 20
Gayndah	1·57	52	0·50	0 72
Gympie	2·18	51	1·61	1·83
Glasshouse Mts. ...	2·33	15	1·73	2·93
Kilkivan	1·75	44	0·52	2·12
Maryborough ...	1·98	52	2·23	1·10

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of Years' Records.	Sept., 1923	Sept., 1922
South Coast—continued:	In.		In.	In.
Nambour	2·55	27	1·14	3·08
Nanango	1·93	41	1·30	1·06
Rockhampton ...	1·35	52	0·45	0·57
Woodford	2·23	36	1·87	2·93
Darling Downs.				
Dalby	1·77	53	1·65	0·68
Emu Vale	1·92	27	1·36	1·35
Jimbour	1·60	35	1·44	0·60
Miles	1·46	38	1·48	0·56
Stanthorpe ...	2·46	50	1·54	1·62
Toowoomba ...	2·25	51	1·10	1·89
Warwick	1·90	58	1·20	1·84
Maranoa.				
Roma	1·55	49	1·81	0·04
State Farms, &c.				
Bungeworgorai ...	1·30	9	1·47	0·04
Gatton College ...	1·73	24	0·69	0·96
Gindie	1·04	24	2·74	0·52
Hermitage ...	1·71	17	1·00	1·66
Kairi	0·67	9	0·02	0·06
Sugar Experiment Station, Mackay	1·57	26	...	1·45
Warren	0·74	9	...	...

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for September this year, and for the same period of 1922, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Government Meteorologist..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1923.	OCTOBER.		NOVEMBER.		DECEMBER.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·34	5·50	5·4	6·8	4·51	6·31
2	5·33	5·50	5·3	6·9	4·51	6·32
3	5·32	5·51	5·2	6·10	4·51	6·33
4	5·31	5·51	5·1	6·11	4·50	6 34
5	5·30	5·52	5·0	6·12	4·50	6·35
6	5·29	5 52	5·0	6·13	4·50	6·36
7	5·28	5·53	4·59	6·13	4·50	6·36
8	5·27	5 53	4·59	6·14	4·50	6·37
9	5·25	5·54	4·58	6·14	4·51	6·37
10	5·24	5·54	4·57	6·15	4·51	6·38
11	5·23	5·55	4·57	6·16	4·51	6 39
12	5·22	5·55	4 56	6·17	4·52	6 39
13	5·21	5·56	4·56	6·18	4·52	6·40
14	5·20	5·56	4·55	6·18	4·52	6·40
15	5·19	5 57	4 55	6·19	4·53	6·41
16	5·17	5·58	4 54	6 20	4·53	6·41
17	5·16	5·58	4·54	6·20	4·53	6·42
18	5·15	5 59	4·53	6 21	4·54	6·42
19	5·14	6 0	4·53	6·22	4 54	6·43
20	5·13	6 1	4·52	6·23	4·55	6·43
21	5·12	6·1	4·52	6·24	4 55	6·44
22	5·11	6·2	4 52	6·25	4·56	6·45
23	5·10	6·3	4·52	6 25	4·56	6·45
24	5·9	6·3	4·52	6·26	4·57	6 46
25	5·9	6·4	4 51	6·27	4·57	6 46
26	5·8	6·4	4·51	6·28	4·58	6 47
27	5·7	6·5	4 51	6·28	4 58	6 47
28	5·7	6·5	4 51	6 29	4·59	6 48
29	5·6	6 6	4·51	6·30	5 0	6·48
30	5 6	6 7	4 51	6·31	5·0	6·49
31	5·5	6·7	...	...	5·1	6·49

PHASES OF THE MOON, OCCULTATIONS, &c.

3 Oct.	☽	Last Quarter	3 29 p.m.
10 „	●	New Moon	4 5 p.m.
17 „	☾	First Quarter	6 54 a.m.
25 „	○	Full Moon	4 26 a.m.

Perigee Oct. 11th at 1·42 p.m.
Apogee Oct. 26th at 12·36 p.m.

The moon will be apparently very close to the planet Mars on the 9th at 4·49 a.m., just before sunrise. About seven hours later the moon will be in conjunction with the planet Mercury. Shortly afterwards Venus and Saturn will be in conjunction at 3·47 p.m. On the 17th at 9 p.m. Saturn will be in conjunction with the sun.

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2 Nov.	☽	Last Quarter	6 49 a.m
9 „	●	New Moon	1 27 a.m.
15 „	☾	First Quarter	7 41 p.m.
23 „	○	Full Moon	10 58 p.m.

Perigee 9th Nov. at 1 a.m.
Apogee 22nd Nov. at 12·54 p.m.

Neptune will be in conjunction with the moon on the 3rd at 5·47 a.m. Venus and Jupiter will be in conjunction on the 5th at 6·11 a.m about 15 degrees east of the sun and setting about an hour later than it. Mercury will be in superior conjunction with the sun on the 16th at 10 a.m., passing it on the far side from west to east. It will be in conjunction with Jupiter on the 20th at 3·53 p.m.

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8 Dec.	●	New Moon	11 30 a.m.
15 „	☾	First Quarter	12 38 p.m.
23 „	○	Full Moon	5 33 p.m.
31 „	☽	Last Quarter	7 7 a.m.

Perigee 7th Dec. at 1 p.m.
Apogee 19th Dec. at 9·12 p.m.

The planets Mars and Saturn will be in conjunction but apparently separated by three diameters of the moon on the 2nd at 5·42 p.m. Saturn will be in conjunction with the moon but more than three diameters above it at 9 a.m. on the 5th. About two and a-half hours later Mars will be in conjunction with the moon but a good deal further above it. Mercury will be at its farthest distance east of the sun on the 28th at 2 a.m., setting about an hour and a-half after it.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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